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February 1994



NEW ENGLAND TRANSPORTATION INITIATIVE

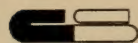
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Inventory Report

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Inventory Report

February 1994

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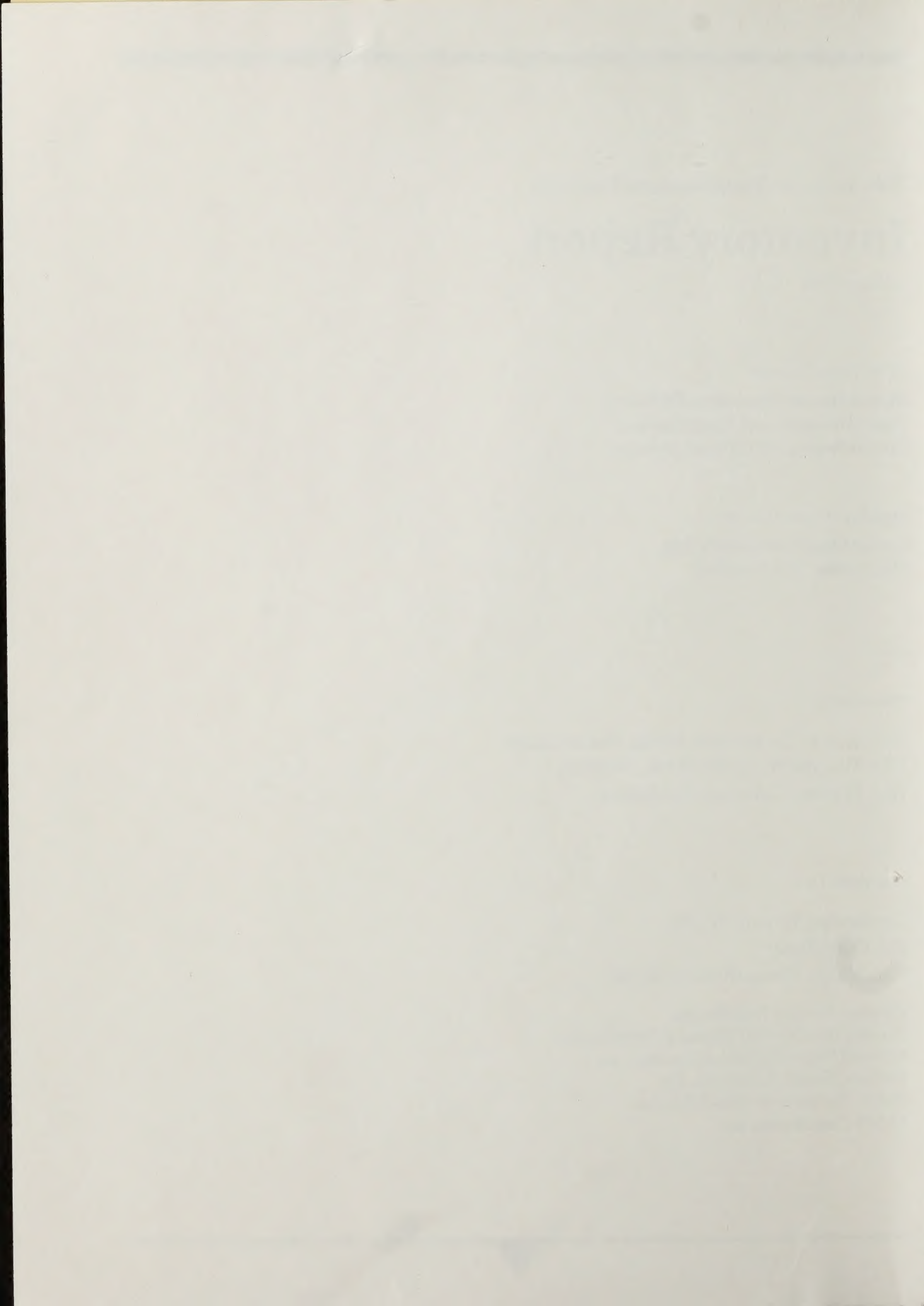


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Introduction

This is the Inventory Draft Report of the New England Transportation Initiative (NETI) Project. NETI is a cooperative transportation planning study sponsored by the six New England states. This is the first of four interim reports which will be produced. The other reports are Forecasting and Issue Identification; Alternative Scenario Definition; and Policy and Technical Analysis.

The purpose of this report is to document existing and planned transportation facilities, and transportation, economic and environmental policies in the six New England states and regionally. Given the diverse nature of the NETI study both geographically and substantively, the Inventory Report is the first opportunity to define the focus of the study to those facilities and policies of regional significance.

The report is organized into four main sections. Part I describes existing conditions for the major transportation modes: highway, rail, airports, ports and pipelines; the institutional and organizational structure of transportation decision making; and a brief discussion of telecommuting. Part II describes the state of the New England economy and some trends for the future. Part III describes existing policies in environmental areas traditionally of concern in the development and implementation of transportation policy. These include air quality, energy, wetlands and waterways, parkland and historic preservation, material disposal, noise, broad spectrum environmental review, land use planning, and aesthetics and quality of life issues.

For this first step in the NETI process, data collection activity was organized along traditional transportation modal lines. Each modal section also contains information on related multi-modal facilities and issues. In subsequent analyses, multi-modal planning will take center stage reflecting its importance in the development of regional transportation strategies, and the emphasis placed on it in the Intermodal Surface Transportation Efficiency Act (ISTEA).

Each chapter is organized generally as follows, allowing for differences in emphasis due to subject matter:

1. Key Issues/Focus
2. Methodology
3. Existing Conditions
4. Planned Facilities
5. Implications for Next NETI Activities

All of the figures and tables, and a list of sources (both written and oral), appear at the end of each chapter.

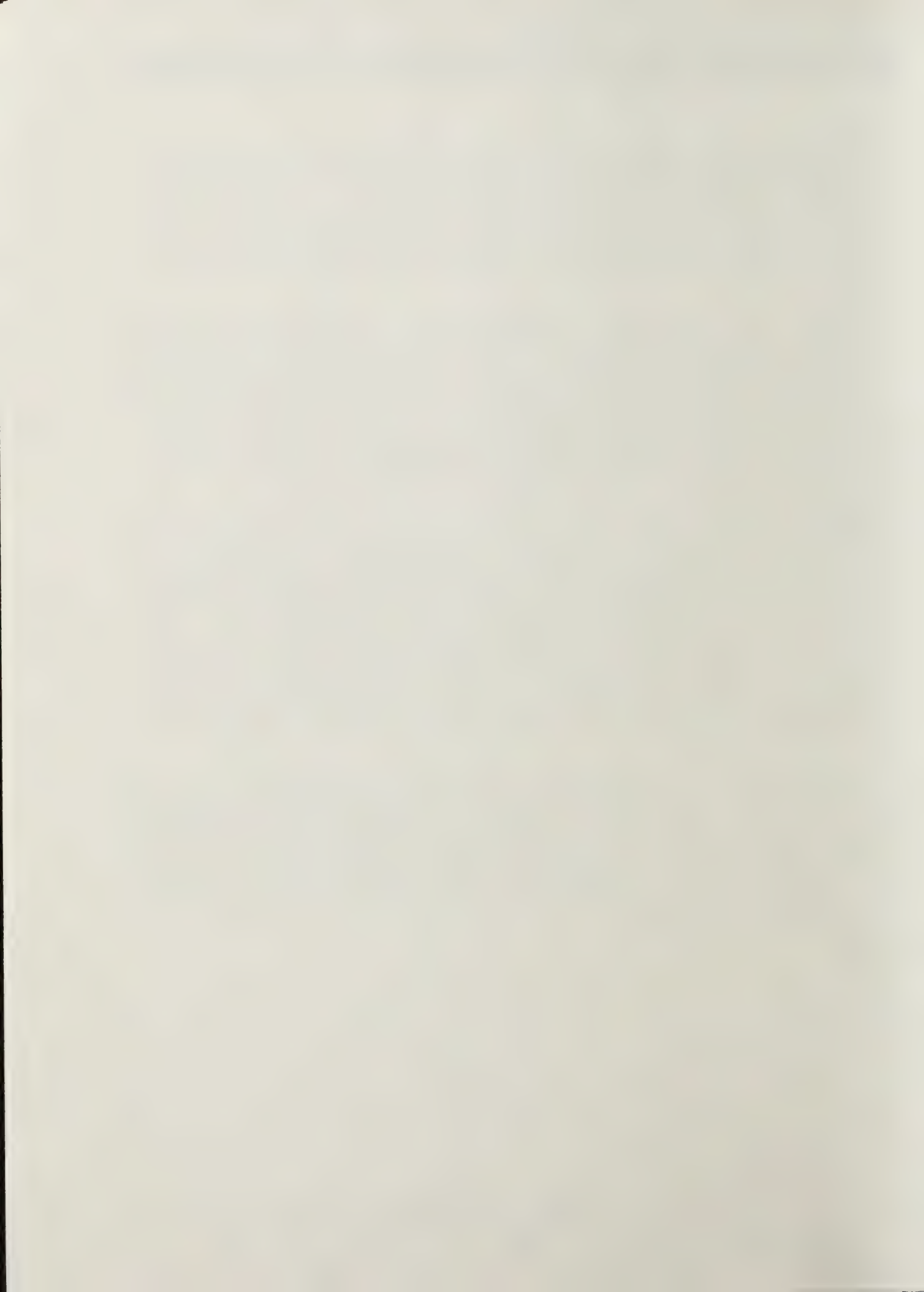


An extensive data collection effort, involving both written sources, interviews with key individuals in the field, and limited data collection surveys, was undertaken for this report. In addition, since each member firm of the NETI consultant team was selected for their previous expertise in a particular discipline, this professional experience and judgement was put to use in the inventory process. These activities were initiated in October, 1993. We would like to thank the many public and private officials who have cooperated in this effort.

In the process of data collection, considerable information was obtained regarding future trends, particularly in compiling data for Section 4.0 ("planned facilities") of each chapter. This is particularly true in the case of the Economics Chapter (7.0) where it was impractical to separate data on existing conditions from historic and future trends. Thus, this report represents a significant start in establishing the database for NETI Task 3 – Forecasting/Trends Assessment. Also, Section 5.0 of each chapter ("Implications for Future NETI Tasks") should be viewed as initiating the thought process for NETI Tasks 4 and 5 – Identification of Goals and Objectives and Issues of Regional Significance.

This report was undertaken in the context of an extensive public participation process. Prior to the initiation of major data collection activities, regional public meetings were held in Concord, NH for the northern tier of states and in Providence, RI for the southern tier. An outline of the inventory process was presented and comments solicited. Three meetings were held with the NETI Policy Committee – consisting of representatives from the Transportation, Economic, and Environmental agencies of the six states. The first round of individual state citizen Advisory Committee meetings was also initiated. During this process, suggestions were made regarding the inclusion of additional topics. While many other issues deserve individual attention, the limited resources of this study necessitate maintaining a focus on those issues of regional significance for which a significant database of information already exist.

The Executive Summary (published separately) will be finalized following review by the New England Regional Technical Advisory Committee (NERTAC) consisting of representatives from each state Advisory Committee. NERTAC members will consult with their respective Advisory Committees in compiling their comments. NERTAC comments will be incorporated into the final edition of the Executive Summary where appropriate or otherwise attached as an appendix to the Executive Summary. The main body of the report will remain a working draft.



Part I. Transportation

1.0 *Institutional and Organizational Issues*

Chapter 1.0 – Institutional and Organizational Issues

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1.0 Institutional and Organizational Issues

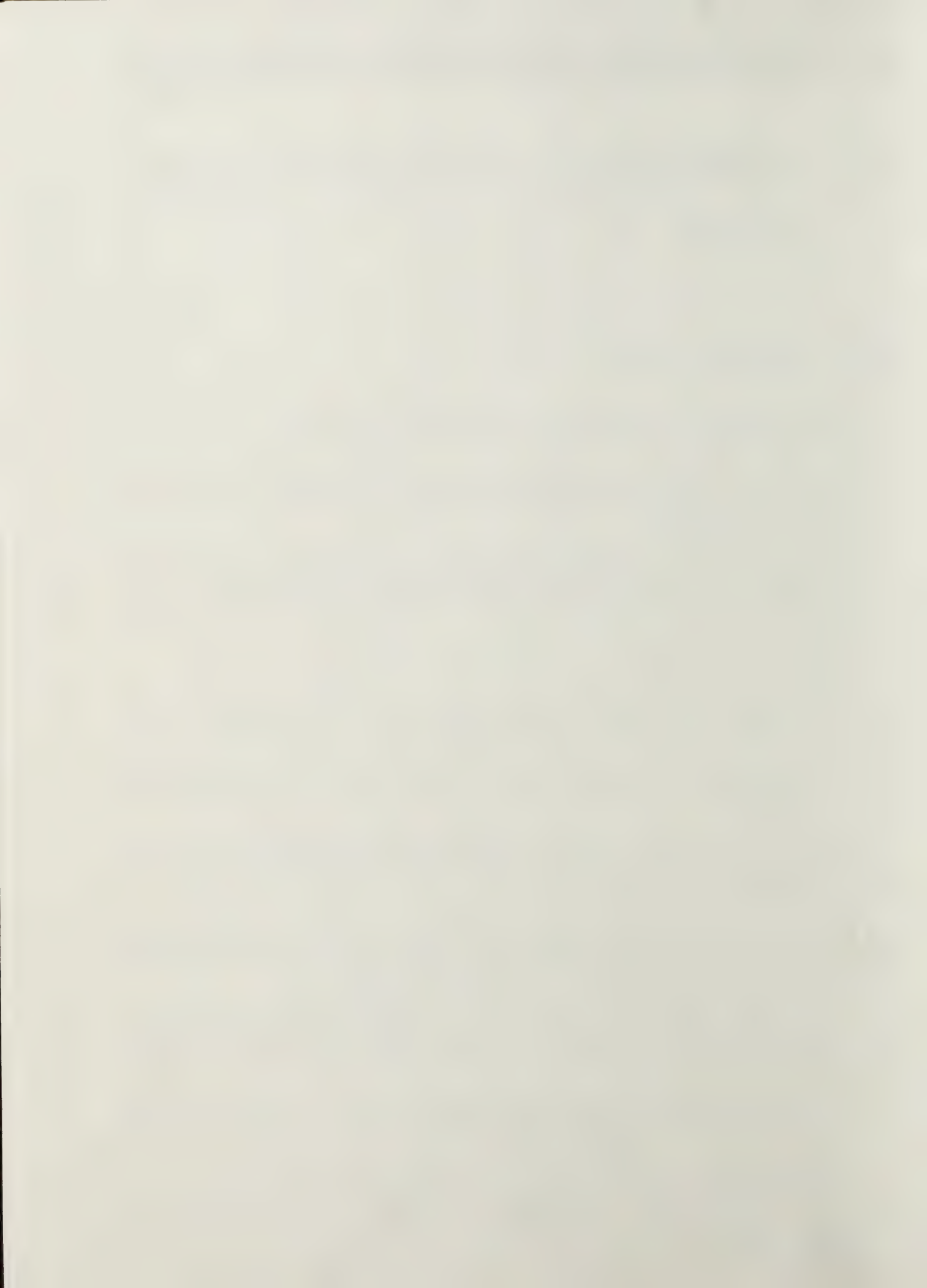
■ 1.1 Key Issues/Focus

1.1.1 Overview – Common Concerns Among the Six States

The purpose of this section is to briefly summarize the current plans, programs and policies of each state and to describe the key participants and issues that affect New England transportation programs.

Based upon our inventory in each state, there are a number of common issues that have been identified. They must be addressed in each state individually as well as for the region as a whole in order to maintain New England's economic viability. They include the following:

- Maintain and rehabilitate the highway and bridge infrastructure;
- Provide alternative modes of transportation to deal with congestion that cannot be addressed by traditional highway expansion programs;
- Provide more efficient connections between modes, for both passengers and commodities;
- Effectively meet all the requirements of the Clean Air Act Amendments of 1990, the 1991 Intermodal Surface Transportation Efficiency Act, the National Energy Policy Act (EPAct), and other federal requirements;
- Use transportation investments to leverage regional economic growth and assist in creating more jobs for New England to the extent possible while meeting system preservation requirements and other transportation objectives;
- Identify and implement programs of common concern that will make the region a major competitive force in the nation and in the world without sacrificing individual state identities or priorities;
- Establish programs that effectively deal with the environment and economic growth in a balanced manner that will meet mobility needs; and
- Establish stable and adequate funding sources to deal with these issues.



1.1.2 The Impact of Federal Regulations

The 1990 Clean Air Act Amendments (CAAA) and the 1991 Intermodal Surface Transportation Efficiency Act (ISTEA) have resulted in some profound changes in the way that state government must deal with all transportation issues. The regulations that have or will be issued to implement those laws will require not only technical changes, but regulatory and institutional changes that will alter the way that all levels of government operate. Those changes incorporate all planning and funding programs.

The 1990 Clean Air Act Amendments (CAAA) established clear and distinct areas of responsibility and time schedules for using transportation investments and other strategies to achieve conformance with national clean air standards. Specific counties and metropolitan regions in New England have been designated as non-attainment areas for ozone and carbon monoxide standards (see Chapter 8.0). The CAAA require that the statewide Transportation Improvement Program (TIP) show quantifiable improvements in those non-attainment areas.

The 1991 ISTEA legislation complements the requirements of the 1990 CAAA, by requiring a strengthened statewide and metropolitan planning process; flexible funding opportunities that promote the development of alternative high-occupancy vehicle modes; and a series of six management systems that will have a major impact on transportation capital programming. Those six systems include: (1) pavement management, (2) bridge management, (3) safety management, (4) congestion management, (5) intermodal management, and (6) transit management.

1.1.3 Common Organizational Elements

Each of the six states are organized differently to plan, design, maintain and operate their statewide transportation systems. However, those differences aside, each shares a number of common organizational/institutional characteristics as follows:

- There exists a State Chief Administrative Officer who exercises direct or indirect responsibility over all transportation functions. In Section 1.3 below, the organizational structure of each state is described.
- Metropolitan Planning Organizations (MPOs) have been established in each urbanized area in accordance with federal requirements to deal with metropolitan transportation issues. Each state works with these MPOs through their planning division. There are several MPOs which do incorporate parts of two states and will thereby impact the results of this study.
- A New England organization called the N.E. ETM (Electronic Toll and Advanced Traffic Management) Group has been formed to develop compatible policies on electronic toll collection systems and advanced traffic management systems. That organization includes all the NETI states but the State of Vermont.

- An Eastern Border Transportation Coalition (EBTC) has been formed consisting of Maine, Vermont, New Hampshire, Massachusetts, New York, and Michigan, and the adjacent Canadian provinces of New Brunswick, Quebec, and Ontario. The function of the EBTC is to plan and secure federal funding pursuant to ISTEA Sections 6015 and 1089 for transportation-related border projects including customs and other border infrastructure facilities, and transportation corridors leading to the borders. Of particular importance to New England and impacting both the highway and railroad modes are issues relating to highway bridge clearances over railroad lines.
- Each state will be required to develop the six management systems required by ISTEA, which could significantly alter their programs and organizations.
- Each state deals directly with the state trucking associations, railroads, and airlines.

■ 1.2 Methodology

This section was based primarily on interviews with key transportation officials in each of the states; either by telephone or in person. Those individual contacts provided valuable information and insights that were used here, but which will also be of significant value as we analyze the results of the inventory and begin to formulate recommendations for consideration by the Policy Committee. A list of the individuals interviewed and documents reviewed is included at the end of the chapter.

■ 1.3 Individual State Profiles

The purpose of this section is to provide a summary of the key policy and institutional issues obtained from interviews with key state officials and from documents available from each of the six New England states. Those interviews and documents were used to provide information, opinions and insights concerning the individual and collective state viewpoints on policy and institutional issues.

1.3.1 Connecticut

The Connecticut Department of Transportation (ConnDOT) is headed by a Commissioner, who is appointed by and reports to the Governor. Within ConnDOT is the responsibility for the planning, design, maintenance, and operation of state highways, urban and intercity rail, seaports and airports (including the state's major air facility at Bradley Airport). Connecticut has recently established a Coastline Port Authority.

Since the economic downturn in the late 1980s, the Connecticut Department of Transportation has been going through a unique period of transformation that is changing the shape of the Department, the nature of its work, and the focus of its mission. This change is being driven by reductions in the work force, severely constrained state budgets, completion of the Interstate System, completion of the catch-up phase of the transportation infrastructure program, the Clean Air Act Amendments of 1990, and ISTEA.

In recognition of the change that is occurring, the Department restructured its organization and established the following revised mission statement and set of principles and values.

Mission

It is the Mission of the Connecticut Department of Transportation to provide a safe, efficient, and cost-effective transportation system that meets the mobility needs of its users.

The Department also recognizes its role in Connecticut's economy – as a creator of jobs statewide, and as a building block of Connecticut's ability to compete internationally. Transportation actions are critical to Connecticut's economic renewal.

In order to achieve its Mission, the Department will continue to abide by the following principles:

- To strive to identify, analyze, and continually improve the way the Department does its work so that it delivers better products and services, and improve its work environment.
- To operate the Department with maximum efficiency, so as to create additional resources for investment in the transportation infrastructure.
- To maintain the transportation system to ensure continued high levels of safety and mobility.
- To maximize the utilization and efficient operation of existing transportation assets.
- To focus our human and financial resources on priorities established through an ongoing, analytical planning process that continually asks the question, "What should the DOT do next to fulfill the Mission?"
- To invest in projects that ensure safety, maintain the existing transportation infrastructure, increase the productivity of the transportation system, promote economic development, and provide necessary capacity enhancements.
- To utilize all available federal and state funds.
- To seek to protect and enhance the natural environment as the Department develops transportation improvements.



- To engage stakeholders in a consultative process from the earliest stages of project development.

The transportation investment goals that have been established are summarized below:

- Ensure safety;
- Maintain existing system;
- Increase system productivity;
- Promote economic development;
- Provide required capacity; and
- Effective utilization of all available state and federal funds.

Each of these goals have been expanded as follows:

1. Ensure Safety

- Eliminate hazards;
- Upgrade signing;
- Maintain lane delineation; and
- Maintain equipment.

2. Maintain the Existing System

- Resurface 438 two-lane roadway miles each year;
- Rehabilitate poor and fair state bridges (approximately 45 per year);
- Replace all buses over 12 years old;
- Maintain all rail cars, track, bridges, power supply systems and stations;
- Rehabilitate runways and terminals; and
- Maintain ferries and state pier.

3. Increase Productivity of the Existing System

- Incident management;
- Interconnected/computer controlled signal systems;
- Ridesharing;
- Commuter and rail station parking;
- Transit service scheduling; and
- Aviation and port marketing.

4. Promote Economic Development

- Provide quality transportation infrastructure;
- Institute urban initiatives; and
- Facilitate economic investment.

5. Provide Required Capacity

- Specific projects as identified as part of the State Master Transportation Plan (1993).

The Connecticut Transportation Commission was established by the State Legislature to provide a substantive input to the ConnDOT on issues relative to the statewide transit program (urban and intercity). It supports the planned electrification of the Northeast Corridor from New Haven to Boston with the understanding that the corridor be utilized not only for passenger service, but also for high speed, truck-competitive intermodal rail freight. In addition, rail freight service to existing and future shippers along the corridor should be assured.

1.3.2 Maine

The Maine Department of Transportation (Maine DOT) is headed by a Commissioner, who is appointed by the Governor. Within Maine DOT is the responsibility for the planning, design, maintenance and operation of state highways, intercity rail, the state airport in Augusta, ports and marine activity. The Maine Turnpike Authority is a separate, independent quasi-public organization. Also of significance is the capital improvement plan "Transportation to the Year 2020" prepared by the Maine Transportation Capital Improvement Planning Commission.

The state's current transportation policies and directions are summarized in a recent publication by Maine DOT titled "Multi-Modal Transportation Improvement Program

(Fiscal years 1994-1995)," May 17, 1993. That document reflects the beginning of a new direction in transportation planning and programming for the state of Maine, consistent with the state's newly adopted "Sensible Transportation Policy Act" and with the goals of ISTEA. Also of significance is the capital improvement plan "Transportation to the Year 2020" prepared by the Maine Transportation Capital Improvement Planning Commission.

The "Sensible Transportation Policy Act" was passed by the Maine Legislature, effective on December 20, 1991. Rules were then adopted by the state to implement that legislation and to deal with relevant federal policies under ISTEA, the National Environmental Policy Act, the Clean Air Act Amendments and the Clean Water Act.

The following policies were established to be used by Maine DOT and the Maine Turnpike Authority in their planning, capital investment and project development process:

- Promote the coordinated and efficient use of all available and future modes of transportation;
- Meet the diverse transportation needs of the people of the state, including rural and urban populations and the unique mobility needs of the elderly and disabled;
- Ensure the repair and necessary improvements of roads and bridges throughout the state to provide a safe, efficient, and adequate transportation network;
- Minimize the harmful effects of transportation on public health and on air and water quality, land use and other natural resources;
- Reduce the state's reliance on foreign oil and promote reliance on energy efficient forms of transportation;
- Be consistent with the purposes, goals and policies of the Comprehensive Planning and Land Use Regulation Act; and
- Incorporate a public participation process in which local governmental bodies and the public have timely notice and opportunity to identify and comment on transportation concerns.

The following goals were established by the Capital Planning Commission:

1. To evaluate the full range of reasonable transportation alternatives for all significant highway construction or reconstruction projects and give preference to transportation system management options, demand management strategies, improvements to the existing system, and other transportation modes before increasing highway capacity through road building activities.
2. To ensure the repair and improvement of transportation facilities through the state to provide a safe, efficient and adequate transportation network.

3. To meet the diverse transportation needs of the people of the state including shippers, rural and urban populations and the elderly and disabled.
4. To be consistent with the purposes, goals and policies of the Comprehensive Planning and Land Use Regulation Act.
5. The Surface Transportation Program includes a 10 percent set aside for safety construction activities and 10 percent for transportation enhancements which encompass a broad range of environmental-related activities.
6. The new Congestion Mitigation and Air Quality Improvement Program directs funds toward projects that improve air quality in non-attainment areas.
7. Start-up costs for traffic management and control activities are provided.
8. Funding is available for transportation planning, research and development.
9. A statewide planning process, transportation plan and transportation program is required.

Consistent with the policies summarized above, the Maine DOT Multi-Modal Plan contains details for all modes of transportation. Those which are multi-state and regional in nature are summarized below.

1. Intermodal Transportation Programs

The Intermodal Transportation Program element of the Multi-Modal Transportation Improvement Program is a new element that identifies specific projects which coordinate two or more modes of transportation in a cost-effective and efficient manner. It contains projects in five categories including: park and ride projects; vanpool and bus projects; development of rail-truck transfer facilities; development of rail-bus-auto transfer facilities; and creation of user-side subsidy transit assistance projects.

2. Ports and Marine Transportation Programs

The Ports and Marine Transportation Program element of the Multi-Modal Transportation Improvement Program consists of three capital project categories including cargo port development, ferry and ferry terminal improvements and small port improvement projects. All of the projects are contingent upon funding availability from state and federal sources. Capital funding projects are recommended for continued development of the state's three cargo port facilities at Eastport, Portland and Searsport. Also, capital funding projects are recommended for improvements for the Maine State Ferry Service in Penobscot Bay and the Mount Desert Island area and for the Casco Bay Island Transit District in Casco Bay.

3. Rail Transportation Programs

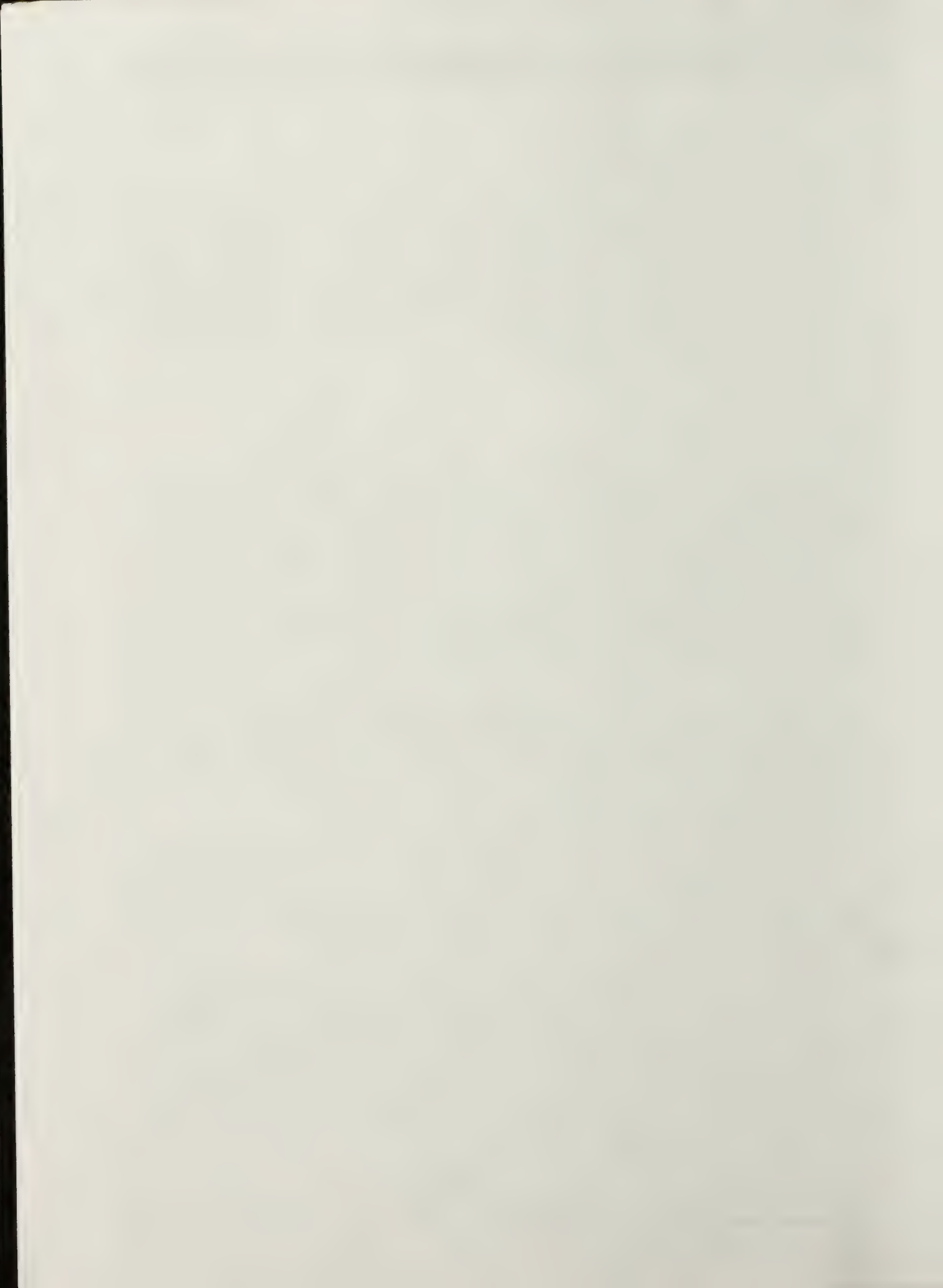
The Rail Transportation Program element of the Multi-Modal Transportation Improvement Program consists of three capital improvement categories and one non-capital preservation initiative. They include: rail rehabilitation projects to preserve the State of Maine's investment on rail property owned by the state and rail trackage owned by private rail carriers; rail construction projects to improve access; and the rail passenger service restoration project from Portland to Boston. Also included is a rail preservation initiative to formally oppose the Canadian Pacific Limited's proposed abandonment of its trackage in Maine.

1.3.3 Massachusetts

The Massachusetts Executive Office of Transportation and Construction (EOTC) is headed by a Secretary of Transportation who is appointed by the Governor. EOTC has the responsibility for the planning, design, maintenance, and operation of the state highway system; the Massachusetts Aeronautics Commission (which coordinates airport planning for all but Logan International Airport and Hanscom Field); the Massachusetts Bay Transportation Authority (which operates the Boston urban transit system); and intercity rail activities. Separate, quasi-public authorities operate as follows: the Massachusetts Port Authority (Massport) operates Logan and Hanscom fields, Boston seaport activities, and the Tobin Memorial Bridge. The Massachusetts Turnpike Authority owns and operates the Turnpike, and the Sumner and Callahan Tunnels between Boston and Logan Airport.

EOTC is in the process of developing a policy-oriented statewide transportation plan. Several policy goals have been established at this stage which will be incorporated into the NETI study. Based upon interviews with several key Massachusetts officials, those interstate/multi-state goals are the following:

- Maintenance of the state highway system;
- Adequate bridge clearances for double-stack railroad cars from the port of Boston to western destinations;
- High speed, cost-effective rail passenger service in the Northeast Corridor;
- High speed rail service between Boston and Albany;
- The application of advanced technology for rail and passenger service in the region;
- The promotion of innovative transportation programs with the private sector;
- In-depth analysis of creative financing for alternative transportation programs;



- Leverage transportation investments to provide economic development; and
- Mitigate adverse environmental impacts related to transportation.

More details will be incorporated as progress is made on the state's transportation plan.

1.3.4 New Hampshire

The New Hampshire Department of Transportation (NHDOT) is headed by a Commissioner who is appointed by the Governor. Within the NHDOT is the responsibility for the planning, design, maintenance and operation of the state highway system, including the turnpike system (under the Bureau of Turnpikes). Also, within the NHDOT is the Division of Aeronautics. The New Hampshire State Port Authority is an autonomous agency which manages the Port of Portsmouth.

Over the past two years, New Hampshire has generated a substantial number of studies and reports which present their strategies and policies for both intrastate and interstate programs.

The report of the 21st Century Task Force provides a capsule summary of the state's policies. The New Hampshire legislature created the Task Force in 1991, under the chairmanship of the Commissioner of NHDOT. It concludes that the state's economy depends on an efficient and effective transportation system to move tourists, visitors, commuters, raw materials, components for manufacturing, and products to wholesale and retail centers. Two major recommendations were made:

- Repair the highway network
 - Repair or replace all deficient or obsolete bridges;
 - Reverse the deterioration in the condition of state and local roads; and
 - Complete essential links in the highway system.
- Provide transportation alternatives
 - Recognize the need for adequate, consistent transportation funding by amending the State Constitution to create a Transportation Fund;
 - Design a transportation system for cleaner air and reduced congestion;
 - Restore the state's railroad system through the acquisition and rehabilitation of lines for both freight and passenger service;
 - Support the cost-effective mobility provided by local and interstate bus services;

- Change land use planning so that development patterns do not continue to foster automobile dependence and congestion; and
- Improve commercial air service facilities to meet future needs.

It should also be noted that New Hampshire has launched a "Statewide Mass Transportation and Air Quality Planning Study" that will provide the basis for a consolidated assessment and analysis of multi-modal transportation needs and policies.

Following is a summary of regional transportation issues which were identified as the state's highest priorities:

- Improve rail freight terminals;
- Promote tourism and its role in economic growth;
- Improve intercity air and bus service;
- Planning for Pease Air Force Base development;
- Improved commercial vehicle operations; and
- Need for compliance with the CAAA and ISTEA.

1.3.5 Rhode Island

The Rhode Island Department of Transportation (RIDOT) is headed by a Director who is appointed by the Governor. Within the RIDOT is the responsibility for the planning, design, maintenance of the state highway system. The quasi-public Rhode Island Port Authority and Economic Development Corporation manages the Port of Davisville. Under the Port Authority, the Rhode Island Airport Corporation (RIAC) leases and runs the airports.

The major source document used was the report "Transportation 2010: Ground Transportation Plan." The State Planning Council adopted the Ground Transportation Plan as part of the State Guide Plan on June 13, 1991. It includes all modes of transportation, and the purpose of the plan is two-fold:

- It is a key element of the State Guide Plan, setting direction for state transportation policy and action. It complements elements dealing with land use, economic development, and other topics. It provides a framework with which local comprehensive plans must be consistent.
- It is a requirement for federal transportation funding.

The goals of the plan are to:

- Provide a balanced transportation system in terms of the type and level of services needed to meet travel demand;
- Improve existing transportation facilities and services in order to provide safe, dependable, and convenient passenger travel;
- Develop innovative transportation programs that will be cost-effective and will further other state goals;
- Support the efficient movement of goods for industry;
- Develop an energy-efficient transportation system;
- Develop transportation programs that contribute toward implementing environmental, economic, and other state policies;
- Provide transportation services for elderly and handicapped persons; and
- Make plans and decisions in coordination with other states, state and local officials, interest groups, and the public.

The Ground Transportation Plan identifies a number of policy issues of concern:

- Highway rehabilitation needs;
- Highway safety;
- Interstate bus service;
- Commuter rail system to Massachusetts and Connecticut;
- Amtrak service in the Northeast Corridor;
- Highway linkage connecting Hartford to Providence;
- A direct connection between Route 146 and the Massachusetts Turnpike; and
- Intermodal connections, including:
 - From Amtrak to local transit (bus, limousine, taxi, etc.);
 - From Amtrak to the University of Rhode Island in Kingston; and
 - From T.F. Green State Airport.

1.3.6 Vermont

The Vermont Agency of Transportation (VAOT) is headed by a Secretary who is appointed by the Governor. Within the VAOT is the responsibility for the planning, design, maintenance and operation of the state highway system; the regulation of motor vehicles; and the funding, design and construction of rail, air and public transportation services.

The Vermont Agency of Transportation has completed or is in the process of undertaking a significant number of multi-modal transportation studies. For the purpose of this report, the reference of particular relevance was the "VAOT Transportation Policy Plan," 1990. It is presented as the cornerstone in the VAOT policy, intended to provide a rational decision-making process to guide the state's investment decisions through the decade of the 1990s.

A set of policies and related goals are presented in that document. Some are directly related to intrastate activities. But others are concerned with interstate and regional issues. Following is a description of each regional policy, and their associated regional goals.

Policy 1

Preserve the existing system of facilities and services, and expand the system only if there are no alternatives.

- Goal 1.2: In cooperation with others, manage the operation of the system and improve and expand intermodal connectivity within and between all transportation types.
- Goal 1.3: Rehabilitate or replace deficient bridges.
- Goal 1.5: When developing policies, plans and programs, emphasize cooperative arrangements with all transportation organizations and with towns and public and private employers.
- Goal 1.7: Foster intercity public transportation.
- Goal 1.9: Acquire or protect corridors designated for future transportation facilities.
- Goal 1.11 Consider safety as a major criterion in all decisions affecting the transportation system, and support safety enforcement, education and regulation activities designed to prevent or reduce injuries.

Policy 2

Assure transportation access to all areas of the state in order to promote economic growth.

- Goal 2.2: Pursue actions designed to connect Interstate 89 through the mid-state and/or Bennington areas with Interstate 87 in New York.

Policy 3

Make transportation investment decisions which minimize the negative effects of transportation on the human and natural environment.

- Goal 3.1: Satisfy environmental requirements in transportation decision making.
- Goal 3.2: Carry out investment that sustains efficient land use development, as well as the historic settlement pattern of compact village and urban centers, separated by rural countryside.
- Goal 3.5: Support energy conservation through choices of development of facilities, funding of services and management of the system.

Policy 4

Undertake investment decision making in close cooperation with Vermont residents, towns, regions and other affected parties.

- Goal 4.1: Maintain a transportation policy planning process to guide and shape balanced expenditures and investment within a partnership process by towns, regions and state agencies, and assure all citizens and groups an opportunity for involvement.
- Goal 4.4: Coordinate the planning, development and management of the transportation system with public economic policies and plans.

Policy 5

Seek a secure financial base for maintaining and developing the transportation system, while advocating financial choices fair and equitable to user groups and each mode.

- Goal 5.4: Address the unique problems associated with rural transportation in the planning process including the movement of people and goods, access of all citizens to rural recreational opportunities and economic development.

The VAOT has recently initiated the development of a comprehensive, statewide, long-range transportation plan (LRTP), which will unify statewide and modal objectives, financing and allocations, priority programming within modes, jurisdiction, and design standards. Regional and local planning processes and special studies remain independent through the Regional Planning Commissions. Modal system plans are also completed independently. Consensus on major policies is developed through the LRTP, setting the stage for the development of the ISTE management systems.

The State of Vermont is in the process of making fundamental changes in the way transportation, land use and the economy interact. The various plans identified above will be used to obtain a statewide consensus on transportation investments.

■ 1.4 Implications for Next NETI Tasks

This section summarizes the major common concerns among the six states as well as individual approaches for dealing with those issues. Each state shares similar objectives in many ways, although they may be expressed somewhat differently. The states each recognize that transportation plays a key role in the promotion of economic growth, but at the same time, transportation programs must be sensitive to environmental considerations. The state programs are also profoundly impacted by federal legislation and the desires of the citizens of each state to consider alternative modes of transportation for passenger travel in particular. There is also a full appreciation for establishing compatible freight transportation systems that serve the economic needs of the region.

Discussions with state officials and with participants at the public meetings held to date has shown a conviction that the six states must identify common initiatives that take advantage of the region's strengths in technology and people. The challenge will be to determine the most effective ways of doing so, in order to insure that the whole is greater than the sum of the individual parts.

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■ Interviews

Connecticut

Michael T. Saunders, Deputy Transportation Commissioner, ConnDOT

Richard Hollis, ConnDOT

Maine

Dana Conners, Commissioner, Maine DOT

Paul Minor, Director, Planning, Maine DOT

Gedeon G. Picher, Director, Policy Analysis, Maine DOT

Massachusetts

Dennis Coffey, Deputy Secretary, EOTC

Valerie Southern, Deputy Secretary, EOTC

Michael Swanson, Deputy Secretary, EOTC

William Steffens, Deputy Commissioner, MHD

Daniel Beagan, Director, BTP&D, EOTC

New Hampshire

Charles O'Leary, Commissioner, NHDOT

Christopher Morgon, NHDOT

Rhode Island

Michael Bennett, Rhode Island DOT

Vermont

Patrick Garahan, Secretary, VAOT

Lloyd Robinson, Deputy Secretary, VAOT

Jeff Squires, Director of Planning, VAOT

Others

Charles Repeta, NETI Project Manager, EOTC

John Clements, Associate Administrator, FHWA

William Gilday, N.E. Governor's Conference

2.0 *Highways*

Chapter 2.0 – Highways

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2.0 Highways

■ 2.1 Highway System

2.1.1 Key Issues/Focus

Focus

This chapter discusses the New England highway system. A subsection addresses intercity bus service as a separate topic.

The inventory phase has served as a data gathering and compilation process with a focus on facilities and issues of regional significance. The highway system in New England is an extensive network of Interstate, U.S., state, and local roads. Early in the process of the project it was agreed that attention would be focused on highways proposed for inclusion in the National Highway System (NHS) since by definition these facilities are of regional significance. The purpose of the National Highway System is to provide an interconnected system of principal arterial routes which will serve major population centers, international border crossings, ports, airports, public transportation facilities, and other intermodal transportation facilities and other major travel destinations; meet national defense requirements; and serve interstate and interregional travel.¹

A decision was also made to develop a Geographic Information System (GIS) comprised of proposed NHS roads in New England. Because of the sophistication of this effort and the need for extensive input and review by the six state departments of transportation, some of the highway-related inventory tasks will continue into January. However, once complete, the NETI National Highway System GIS will provide analytical and mapping capabilities for the remainder of the project tasks. A more detailed explanation of the methods being used in the highway inventory work is contained in Section 2.1.2.

The focus of the highway inventory is the proposed National Highway System in New England as shown on Figure 2.1. The NHS was established by ISTEA. It includes all Interstate highways and other U.S. and state-numbered routes as proposed by the states and then partially modified by the U.S. Department of Transportation. The NHS routes discussed in this report may differ somewhat from those recently proposed by the Secretary of Transportation to the U.S. Congress. Any recent federal changes will be incorporated as the NETI project advances.

¹/ Intermodal Surface Transportation Efficiency Act (ISTEA), Public Law 102-240, Section 1006, December 18, 1991.

The Secretary of Transportation's recent submission to Congress included 158,687 miles of roadways in the United States. About four percent (5,718 miles) lie within the six New England states as shown in Table 2.1. About 45 percent of the mileage of NHS routes in New England are classified as urban compared to only 25 percent in the United States. Massachusetts has the greatest amount of NHS route mileage of the New England states (1,859 miles), and Rhode Island has the least (267 miles).

Key Issues

Congestion on New England's regional highway system is viewed as an impediment to commerce, a drain on resources, and a contributor to air pollution. The construction of additional roadway capacity through widening existing roadways or building new roadways is one solution to traffic congestion. Another is managing travel demand through increased use of transit and ridesharing, thereby decreasing reliance on the single occupant vehicle (SOV). The policy orientation of ISTEA and the Clean Air Act Amendments, combined with environmental and financial constraints, make capacity expansion increasingly problematic in New England. One of the objectives of the NETI study should be to address the appropriate balance between these two approaches.

Planning a regional highway system to meet the needs of the 21st century requires a cooperative effort among the six New England states. Therefore, it is essential that the states evaluate the full array of highway infrastructure improvements with the goal of improving regional mobility and safety. Transportation improvement projects and other actions to be evaluated include:

- Completing essential links in the regional highway system;
- Adding capacity to existing regional roadways where warranted;
- Building or expanding systems of high occupancy vehicle (HOV) lanes in the more dense metropolitan areas;
- Reducing reliance on unnecessary SOV travel through transportation demand management (TDM);
- Reducing vehicle emissions;
- Encouraging use of alternative transportation modes including transit, carpools, vanpools, bicycles, and walking;
- Improving commercial vehicle operations through cooperative efforts;
- Incorporating intelligent vehicle highway systems (IVHS) technologies to maximize the capacity of the region's highways; and
- Determining how to allocate scarce transportation funds to repair and maintain existing highways and bridges.

Improving air quality by reducing carbon monoxide and ozone-precursors from vehicle emissions as mandated by the Clean Air Act Amendments of 1990 (CAAA) will be a challenge to the New England states. One strategy is to manage growth by the use of alternative transportation modes and the use of alternative fuel vehicles. Both methods lend themselves to cooperative efforts among the states.

Commercial vehicles are an important user of the region's highway system and their needs must also be incorporated in future planning. Streamlining the regulation of commercial vehicle operations (CVO) within and among the New England states could benefit the states as well as the motor carriers and improve the competitiveness of the entire region. The states could investigate measures to enhance the movement of goods by truck through appropriate routing, registration, permitting and taxation. Measures required by ISTEA might be enhanced by additional actions aimed at creating transparent borders between the New England states. Where possible and practical, IVHS technologies should be employed.

The issues of improved mobility through more efficient and environmentally sound transportation systems are common to all of the New England states. Highways will remain an integral component of the future transportation system. How the highway infrastructure is planned and managed in coming years will in large part affect the effectiveness of the total transportation system.

2.1.2 Methodology

In order to analyze the New England highway system with a goal of identifying issues of regional significance, it was necessary to determine the level of highways to be included and appropriate analytical tools. Research was conducted initially to determine the extent and status of the proposed National Highway System, a designation created by ISTEA for the most important roadways in the United States. ISTEA required that by December 18, 1993, the Secretary of Transportation submit for approval to Senate and House committees a proposed National Highway System.

Early in the study, Federal Highway Administration (FHWA) officials in New England were contacted to determine the status of the designation of NHS routes in each state. At that time each state had submitted to their FHWA district office several iterations of their proposals. The district offices had approved each state's submission and forwarded them to FHWA headquarters in Washington.

Paper maps of each state's NHS submission were obtained in early November 1993. The next step was to create a Geographic Information System (GIS) for the proposed NHS in New England. Since such a GIS has not been created by the FHWA and is not expected for some time, other alternatives were investigated.

The National Highway Planning Network (NHPN), a database of major highways in the United States was obtained from the Transportation Planning and Policy Group at the Oak Ridge National Laboratory in Tennessee. The network is based on a set of roadways

digitized from the National Atlas by the U.S. Geological Survey (USGS) and is intended to provide a foundation for studies of highway performance. The network was enhanced by the Oak Ridge National Laboratory by adding additional roads and attribute data and released to the public on December 22, 1992.

It was determined that most of the proposed NHS roadways in New England were included in the NHPN file. Maps of the NHPN were plotted and highway links on the proposed National Highway System were identified. The NHPN database file was then edited by designating each link in the NHS. While most NHS roads were contained in NHPN, some were not. A series of mostly state highways in eastern Massachusetts were digitized in the NHPN to provide a nearly complete NHS in New England. Because of the fine level of detail of the NHS system in the inner core of the Boston area (e.g., downtown streets), some of these roadways were not added to the network. Major routes through downtown Boston such as the Mass Pike and Central Artery are included.

Once this extensive task was completed, large-format maps showing the NHS in New England were plotted. Northern and southern sections of New England were plotted on separate maps so that route and link numbers were readable. The maps were annotated with unique numbers assigned to all segments (links) on NHS routes. NHS routes were segmented where they intersected other NHS routes or crossed a state line.

The data contained in the NHPN was examined to determine which fields would be useful in the NETI highway analysis. Table 2.2 lists and describes the NHPN data fields that were extracted into the newly created NHS file.

Information contained in the NHPN file for each of the data fields shown in Table 2.2 was printed for all NHS links. An examination of these data revealed some inconsistencies and apparent errors, especially on the number of lanes and segment length. For this reason, the states were asked to review the data and correct errors. While this information was determined to be useful for the NETI analysis, it was not complete enough to conduct a traditional highway capacity analysis. Therefore, additional data fields were identified and these are described in Table 2.3.

Traffic volume fields were defined so that capacity analyses could be conducted for all NHS links in New England. Additional data such as lane widths, design speed, and peak hour factor will be used to determine the maximum service flow rate as defined in the Highway Capacity Manual.²

The selected NHPN data fields and the new data fields shown above were merged into a structure for the newly created NHS GIS. Tables were printed with a row for each link in the NHS database. Data from the NHPN file were shown for those fields extracted from the NHPN. No data were shown for the newly created fields. These tables together with the large format NETI NHS maps were transmitted to the states on December 7, 1992. Generally, these mailings went to the director of planning at each state department of transportation (DOT).

²/ Highway Capacity Manual (Special Report 209), Transportation Research Board, 1985.

Each DOT was asked to review and edit the data displayed from the NHPN and also supply the data requested for the new NHS fields. Some of this information should be available from "route logs" the DOTs recently prepared for a FHWA principal arterial database. The states were requested to return the completed NETI tables with any corrections to the NHS network map by December 22, 1993.

Maximum service flow rates will be calculated based on the number of highway lanes, lane widths, design speed, the percentage of trucks, and the development environment. Recent annual average daily traffic volumes were used together with other factors to determine design hour traffic volumes. Volume to capacity ratios (V/C) and levels of service were calculated for all NHS roadway segments. Results of this analysis are displayed on Figure 2.2 and described in Section 2.1.4. Segments with high V/C ratios are highlighted.

In addition to the process described above, a review of plans and program documents from each of the state DOTs was conducted. Projects planned or programmed for implementation on proposed NHS roadways in New England were identified. Those projects that would significantly increase the capacity of the regional highway system were reviewed and project data were compiled in tables for each state (see Section 2.1.4). The location of each project within the New England NHS was identified using the NHS link numbers developed for the NETI project. This will allow the production of maps showing the location of major highway improvement projects throughout New England.

2.1.3 Existing Facilities

This section contains a description of the major highways in New England that have been proposed for inclusion in the National Highway System (NHS). The initial inventory efforts of the NETI project have focused on identifying NHS roadways and collecting attribute data on major roadway segments as described in the previous section. Since the National Highway System in New England consists of over 5,700 miles of roadways and nearly 700 roadway segments (as defined in this study), the following description is provided to summarize the roadways being evaluated.

Interstate Highways

As stated previously, all Interstate highways are included in the National Highway System. Four primary Interstate highways provide north-south access in New England:

- **Interstate 95**, which runs from Greenwich, Connecticut in the south to Houlton, Maine at the Canadian border, lies within all the New England states except Vermont. Major urban and metropolitan areas directly served by I-95 are:
 - Stamford, Bridgeport, New Haven, and New London, Connecticut;
 - Providence, Rhode Island;
 - Metropolitan Boston;

- Portsmouth, New Hampshire; and
- Portland, Augusta, and Bangor, Maine.
- **Interstate 91** begins at New Haven, Connecticut in the south and runs the entire length of New England to the Canadian border near Newport, Vermont. Urban areas served by I-91 are:
 - New Haven and Hartford, Connecticut;
 - Springfield, Massachusetts; and
 - Brattleboro, White River Junction, and St. Johnsbury, Vermont.
- **Interstate 93** connects the Boston Metropolitan Area to I-91 in St. Johnsbury, Vermont. Urban areas served by I-93 are:
 - Metropolitan Boston;
 - Manchester and Concord, New Hampshire; and
 - White River Junction, Barre – St. Johnsbury, Vermont.
- **Interstate 89** runs northwesterly from Concord, New Hampshire to the Canadian border near St. Albans, Vermont. Urban areas served by I-89 are:
 - Concord and Lebanon, New Hampshire; and
 - White River Junction, Barre – Montpelier and Burlington, Vermont.

Only two major Interstate highways traverse New England from west to east:

- **Interstate 90** connects Albany, New York with Boston. In eastern New York, I-90 intersects two major north-south routes: I-87 (New York State Thruway) and the Taconic Parkway. Called the Massachusetts Turnpike or the "Mass Pike," I-90 runs the entire length of Massachusetts connecting the Berkshires, Springfield, and Worcester to downtown Boston. The Mass Pike intersects Interstate Routes 84, 91, 93, 95, 290, 395, and 495.
- **Interstate 84**, which begins in the west in Scranton, Pennsylvania, enters New England near Danbury, Connecticut. From there I-84 runs northeastward toward central Massachusetts, terminating at the Mass Pike near Sturbridge. Urban areas served by I-84 are: Danbury, Waterbury, New Britain, Hartford, and Manchester, Connecticut.

Additional Interstate routes include shorter spur or loop routes designated by three-digit numbers. Those beginning with even numbers are routes through or around cities:

- **Interstate 289**, a circumferential route around Burlington, Vermont (one four-mile section is open);
- **Interstate 290**, a short route through Worcester, Massachusetts with a connection to I-495;
- **Interstate 295**, a circumferential route around Providence, Rhode Island;

- **Interstate 295**, an 11-mile route through Portland, Maine connecting to I-95 in Scarborough and Falmouth;
- **Interstate 495**, a major circumferential route around Boston beginning in Wareham near Cape Cod and proceeding north to Salisbury, Massachusetts. The northern segment of I-495 serves the Lowell and Lawrence-Haverhill urban areas; and
- **Interstate 495 (Maine Turnpike)**, which lies west of I-95, provides access to the Lewiston-Auburn area from Portland to the south and Augusta to the north.

Interstate spur routes to cities designated by three-digit numbers beginning with an odd number are:

- **Interstate 189**, a short spur route connecting U.S. 7 and I-89 in Burlington, Vermont;
- **Interstate 190**, a spur route leading to Worcester, Massachusetts from the Leominster-Fitchburg area;
- **Interstate 195**, a spur route between Providence, Rhode Island and Wareham, Massachusetts which serves the Fall River and New Bedford, Massachusetts urban areas;
- **Interstate 195**, a short spur route connecting I-95 to U.S. 1 in Saco, Maine;
- **Interstate 384**, a spur route to Hartford, Connecticut from the east which connects to U.S. 6 from Providence, Rhode Island;
- **Interstate 395**, a major spur route linking New London, Connecticut and Worcester, Massachusetts; and
- **Interstate 395**, a short spur route from Bangor, Maine to Holden Center east of the city.

Other NHS Highways

In addition to the Interstate highways, selected U.S. and state highways are proposed for inclusion in the National Highway System. Some of the other (non-Interstate) proposed NHS routes are listed below. The list includes most controlled access and other divided highways that are proposed NHS routes as well as some two-lane facilities of regional significance:

- **U.S. 1** – Brunswick to Belfast, Maine; Houlton to Fort Kent, Maine; Westerly to Frenchtown, Rhode Island;
- **U.S. 2** – Montpelier, Vermont to Bangor, Maine;
- **U.S. 3** – Nashua, New Hampshire to Cape Cod;

- U.S. 4 – Concord to Portsmouth, New Hampshire; New York border and Castleton to White River Junction, Vermont;
- U.S. 5 – I-91 in Meridian, Connecticut to I-91 in Windsor Locks, Connecticut;
- U.S. 6 – I-384 terminus to Providence, Rhode Island; Buzzards Bay to Provincetown, Massachusetts;
- U.S. 7 – Burlington, Vermont to Williamstown, Massachusetts; Pittsfield, Massachusetts to Canaan, Connecticut; Danbury to Norwalk, Connecticut;
- U.S. 20 – Worcester to Watertown, Massachusetts;
- U.S. 44 – Providence, Rhode Island to Plymouth, Massachusetts;
- U.S. 202 – I-84 in Danbury, Connecticut to I-391 north of Springfield, Massachusetts;
- U.S. 302 – I-95 in Portland, Maine to I-93 in New Hampshire;
- MA 2 – Williamston to Cambridge, Massachusetts;
- MA 9 – Pittsfield, Massachusetts to Boston;
- MA 24 – Fall River to Randolph, Massachusetts;
- MA/RI 146 – Providence, Rhode Island to Worcester, Massachusetts;
- RI 102 – I-95 to RI 146;
- CT 2 – Norwich to Hartford, Connecticut;
- CT 8 – Winsted to Stratford, Connecticut;
- CT 9 – New Britain, Connecticut to I-95;
- NH/VT 9 – Bennington, Vermont to Concord, New Hampshire;
- NH 101/51 – Keene to Hampton, New Hampshire;
- F.E. Everett Turnpike – Nashua to Manchester, New Hampshire;
- Spaulding Turnpike/NH 16 – Portsmouth to Milton Mills, New Hampshire;
- NH 16 – Milton Mills to Berlin, New Hampshire; and
- ME 4 – I-495 in Auburn to U.S. 2 in Walton.

2.1.4 Capacity Analysis

The methodology for conducting the capacity analysis of NHS roadways was presented in the previous section. Data problems prevented the inclusion of Connecticut and Maine data in the analysis of existing conditions; these will be incorporated in the next phase of the study, the forecasting and trends assessment task.

The Massachusetts data were provided in slightly different format from the other states. EOTC submitted its principal arterial route list prepared for the Federal Highway Administration in March 1993 without annual average daily traffic (AADT) data for interstate highways. This AADT data for interstate highways were manually extracted from Highway Performance Monitoring System (HPMS) printouts and input in the principal arterial file. Volume to capacity ratios were then computed for all principal arterials in Massachusetts, only some of which are proposed for inclusion in the National Highway System. Several assumptions were made to allow the calculation of volume-to-capacity ratios. Based in part on analysis conducted for the Metropolitan Boston IVHS Study, the following values were applied to all NHS links in Massachusetts:

K-factor	7% (Percentage of daily traffic that occurs in peak hour)
Directional split	60%
Percent heavy trucks	4%
Peak hour factor	95% (Percentage of peak-15 minute traffic that occurs in peak hour)

Because roadway-specific rates were not provided for Massachusetts, the resulting analysis for Massachusetts roadways is less accurate than that included for other states.

The data received from the states were used to calculate volume-to-capacity (v/c) ratios for NHS road segments using procedures outlined in the Highway Capacity Manual. First, service flow rates were calculated using AADT, K-factor, directional split, and peak hour factors for each roadway. Capacities were calculated based on the number of highway lanes and on highway type and development environment (fE) and heavy vehicle factors (fHV). The results of this analysis are portrayed on Figure 2.2. Volume-to-capacity ratios are shown for three ranges. Highway segments with v/c ratios in excess of 0.90 are shown with the widest thickness of line. Generally, roadways with v/c ratios in excess of 0.90 are operating at or near capacity during peak hours. A summary of the most congested roadways in New England based on this criterion follows. Other roadways may experience congestion on a seasonal basis.

Rhode Island

North of RI 102, Interstate 95 operates at or near capacity (v/c greater than 0.90) during peak hours across the remainder of Rhode Island. Between RI 102 and RI 4, Interstate 95 has four lanes and AADT of 47,600. North of RI 4 and into downtown Providence, I-95 has eight lanes and AADT in the range of 116,000 to 156,000 vehicles. The segment exhibiting the highest daily volumes (168,800) is north of RI 10.

Several other NHS roadways in the greater Providence area also exhibit peak hour congestion with v/c ratios in excess of 0.90. These include:

- **RI 146**, a four-lane divided highway north of the city between I-95 and I-295, which has an AADT of 38,900 vehicles;
- **RI 103/114**, a two-lane undivided highway in Barrington with an AADT of 20,500 vehicles;
- **I-195**, east of Providence which has AADT in the range of 143,000 immediately east of I-95 on an eight-lane section to 60,300 on a six-lane section through East Providence;
- **RI 10/RI 195**, a north-south, four-lane divided highway immediately west of downtown Providence with AADT of 67,700 (RI 10) and 86,000 (RI 195);
- **US 6**, a four-lane divided highway section west of downtown Providence between RI 10 and I-295 with 43,100 AADT; and
- **RI 37**, a short three-lane divided section east of I-95 with an AADT of 44,700 vehicles.

Massachusetts

Coming from Rhode Island, Interstate 95 does not operate at or near capacity (v/c greater than 0.90) during peak hours until near its intersection with MA 128 and I-93 in Canton. This six-lane section just south of MA 128 has an AADT of 153,000 vehicles. I-95 merges with MA 128 in Canton and serves as a circumferential route through the western suburbs of Boston. The entire length of I-95/MA 128 from Dedham in the south to Peabody in the north exhibits peak hour congestion with traffic at or near capacity (v/c greater than 0.90). The six-lane section in Dedham has an AADT of 155,000 vehicles. An eight-lane section from Waltham in the south to the junction with I-93 in the north also has an AADT in the 145,000 to 155,000 vehicle range. The most northerly section of the combined I-95/MA 128 narrows to six lanes and has an AADT of 104,000 vehicles.

A 10-mile section of MA 24 between I-495 and MA 27 in Brockton exhibits traffic flows at or near capacity. AADT ranges from 70,000 to 90,000 vehicles on this four-lane divided highway. Also, the 2.5 mile section of MA 123 east of SR 24 into Brockton operates at or near capacity (v/c greater than 0.90) with an AADT of 85,000 vehicles on a four-lane divided highway. A short section of US 44 just west of SR 3 in Plymouth also shows a v/c ratio greater than 0.90 with an AADT of 50,000 vehicles on a two-lane undivided highway.

Interstate 93 provides access into the greater Boston area from the south. I-93 begins at the junction with I-95/MA 128 in Canton and continues eastward to the intersection with MA 3 in Quincy. This eight-lane section of I-93/MA 128 operates at or near capacity with an AADT of 175,713 vehicles. Turning directly toward Boston in Quincy, I-93 (Southeast Expressway) is six lanes with an AADT of 162,627 and v/c ratios in excess of 0.90 are exhibited along the entire length of I-93 through Boston. The EOTC's database shows an AADT of more than 200,000 vehicles on the six-lane Central Artery (I-93) just north of its intersection with the Mass Pike (I-90). North of the Charles River, I-93 has an AADT of

159,000 vehicles on a six-lane section. Between MA 60 in Medford and I-95/MA 128, Interstate 93 widens to eight lanes, and AADT ranges from 145,000 to 155,000 vehicles.

The parallel segment of US 3 between MA 60 in Arlington and I-95/MA 128 in Woburn also operates at or near capacity during peak hours (v/c greater than 0.90) with an AADT of 75,825 on a four-lane facility. Also inside 128 and exhibiting v/c ratios greater than 0.90 are the Callahan and Sumner Tunnels (MA 1A) which each carry an AADT of over 48,000 on two lanes, between downtown Boston and Logan Airport.

North and west of Boston outside the 128 corridor, US 3 operates at or near capacity all the way to the New Hampshire border with AADT ranging from 64,000 to 91,000 on this four-lane divided facility. A short segment of I-93 in Wilmington just south of I-495 also operates at or near capacity with an AADT of 117,000 on six lanes. Several short segments of two-lane undivided NHS roadways between I-95/MA 128 and I-495 exhibit v/c ratios in excess of 0.90. These are MA 2 in Concord (41,000 AADT) and MA 125 in Andover (32,000 AADT).

The analysis of recent AADT data supplied by EOTC only showed two major NHS roadway segments west of I-495 which operate at or near capacity: a five-mile two-lane section of MA 9 east of Worcester (44,442 AADT) and a seven-mile four-lane section of US 20 linking Springfield and West Springfield (126,602 AADT).

New Hampshire

As stated in the previous section, US 3 operates at or near capacity (v/c greater than 0.90) in Massachusetts from I-95/SR 128 to the New Hampshire border. This situation continues across the state line with AADT of about 70,000 on the four-lane divided F.E. Everett Turnpike (US 3) section through the Nashua area to NH 101A, a distance of over seven miles. The 20-mile long, four-lane section of I-93 between the Massachusetts state line and I-293 in Manchester also operates at or near capacity (60,229 AADT). The other major NHS roadway exhibiting a v/c ratio greater than 0.90 is I-293 in Manchester, a four-mile long, four-lane highway with an AADT of 61,800. NH Route 16 in the North Conway area also exceeds 0.90.

Vermont

The volume-to-capacity analysis based on AADT data revealed no NHS roadways in Vermont with v/c ratios in excess of 0.90.

2.1.5 Highway Permitting Process

This section summarizes the environmental permitting process for highway projects in the New England states. Permit issues that may arise from construction of a highway that involves the acquisition of land contaminated by the release of hazardous materials are not

included. Air quality-related issues are discussed in Chapter 8.0. Additional information regarding environmental laws and regulations affecting all modes is provided in Chapter 9.0.

This analysis is somewhat generalized, since improvements to the National Highway System may include a variety of construction options with widely differing ranges of impacts. There may be additional permits required which this analysis does not identify, but which would depend on the specific project.

Federal

All improvements to the NHS would be subject to federal environmental regulations, which will not vary among states to any significant degree. These include the following programs:

- National Environmental Policy Act (NEPA) compliance. Any transportation improvement project would be required to complete an analysis of project-related impacts and benefits. Depending on the level of impacts, this process could involve the preparation of a Categorical Exclusion (CE) statement; an Environmental Assessment (EA); or an Environmental Impact Statement (EIS).
- Department of the Army Permit. Any project involving impacts to wetlands or waterways would be required to obtain a Department of the Army Permit issued under Section 404 of the Clean Water Act by the Corps of Engineers. The Corps has established a process for coordinated review of the Section 404 permit application with the NEPA process, known as the "Highway Methodology." This methodology involves review by the Corps, the EPA, and the U.S. Fish & Wildlife Service at several key stages of project development and NEPA review, and culminates in permit issuance.
- Water quality certification under Section 401 of the Clean Water Act is required to be issued by the state, prior to the Corps issuance of a Section 404 permit. The Section 401 program is state-administered, and varies considerable among states.
- National Pollutant Discharge Elimination System (NPDES) Stormwater Discharge Permit. Any project which results in the alteration of more than 5 acres of land must complete a Stormwater Pollution Prevention Plan (SWPPP) in accordance with the EPA's Best Management Practices manual. A Notice of Intent must be filed with the EPA to qualify for the General Permit. Certain areas, in certain states, will not qualify for the general permit and require an individual permit application. This does not apply in Rhode Island or Connecticut.
- Coast Guard Bridge Permit. Any project involving new bridge construction, or reconstruction of an existing bridge over a coastal waterway, would require issuance or modification of a Coast Guard Bridge Permit.

Massachusetts

Massachusetts has a series of permits required, particularly for wetlands-related impacts. In addition, the state has a comprehensive environmental review process.

- Massachusetts Environmental Policy Act (MEPA) compliance would be required for any highway improvement project, and generally runs parallel to the NEPA process. This process would start with the preparation of an Environmental Notification Form (ENF). Depending on the magnitude of project impacts (and on project costs), an Environmental Impact Report (EIR) may be required. This process, similar to NEPA, requires the identification of all project impacts and benefits, and mitigation for any unavoidable impacts.
- Wetlands Protection Act (MGL Ch. 131 s. 40). A wetlands permit, called an "Order of Conditions," would be required for any project that would alter a wetland, or even for work within 100 feet of a wetland. This permit would be issued by the local Conservation Commission if impacts were less than the regulatory threshold of 5,000 square feet. Greater impacts would require, subsequent to local review, review by the Department of Environmental Protection and issuance of a Variance by the Commissioner upon demonstration of an overriding public need.
- Coastal Zone Management. Any project located within the Massachusetts Coastal Zone would be required to demonstrate consistency with the Coastal Zone Management Plan.
- Water Quality Certification. Water quality certification is issued automatically in some cases (alteration of less than 5,000 square feet of wetlands or waterways) on issuance of an Order of Conditions. Projects with larger impacts require an individual application, which must demonstrate that there are no alternatives which result in less wetland impact.
- Waterways License. Under MGL Ch. 91, licenses are required for any work in former (filled) tidelands, lands currently subject to tidal flows, Great Ponds, and certain inland waterways. Any placement of fill, placement of piles, new bridges, or reconstruction of existing bridges would require obtaining a license or modifying an existing license.
- Rare and Endangered Species. A permit would be required under the Rare and Endangered Species Act for any project that would affect the habitat of a state-listed animal or plant species.

Vermont

Vermont has a comprehensive environmental review/permitting process, which generally occurs after the completion of any NEPA process. Additional environmental permits will be required, and would be issued subsequent to the environmental reviews:

- Act 250. This statute requires the review of major projects (commercial/industrial construction, subdivision of land, construction of new roads longer than 800 feet, state/federal government construction projects affecting more than 10 acres) to examine project-related impacts on water and air pollution, soil erosion, traffic, natural resources, and local/regional development plans. A District Environmental

Commission will review applications, hold hearings and grant or deny permits under this statute.

- Stream Alteration Permit may be required from the Agency of Natural Resources for any construction that affects streambeds.
- A Conditional Use Determination may be required from the Agency of Natural Resources for any activity within a wetland or buffer zone, where these apply. Conditional Use Determinations generally require demonstration of avoidance, minimization, and mitigation of impacts, in accordance with federal regulations. Alteration of a state-designated Class 1 wetland requires demonstration of compelling public need.

New Hampshire

New Hampshire does not have a comprehensive environmental review process, but does regulate work in and adjacent to wetlands. The following regulatory programs may apply:

- NH Fill and Dredge in Wetlands Act (RSA 482-A) permit would be required for any work performed within state-regulated wetlands or waterways. The regulations establish three categories of permits, depending on the magnitude of impacts and the classification of the wetland.
- Water Quality Certification is issued by the Wetlands Board concurrent with a wetlands permit, and generally does not require separate application.
- Projects which result in the alteration of less than three acres of wetlands and receive a permit from the state may be eligible for the NH Statewide General Permit under Section 404 of the Federal Clean Water Act, and may not require a separate application to the Corps.
- Site-Specific (Alteration of Terrain) Permit (RSA 485-A:17, RSA 483-B) is an erosion control permit, required where the project will involve alteration of more than 100,000 square feet, or more than 50,000 square feet within the Shoreland Protection Zone.

Connecticut

Connecticut does have a comprehensive environmental review program, coordinated with issuance of specific permits. As in Rhode Island, freshwater and coastal wetlands are regulated under separate permit programs. The Connecticut DEP Listing of Environmental Permits, Licenses and Programs of the Connecticut Department of Environmental Protection (DEP Bulletin 13) notes that for highway construction, permits and related laws are "Too numerous to note."

- The Long Island Sound Programs regulate construction within the coastal zone. Any dredging, erection of structures, or placement of fill within coastal waters requires the issuance of either a Structures, Dredge and Fill Permit (CGS Section 22a-361) or a Tidal Wetlands Permit (CGS Section 22a-32). A Sand and Gravel Permit (CGS 22a-384) is required for any subtidal excavation.

- Connecticut Environmental Protection Act (CEPA, CGL 22a-14) review may be required, depending on the magnitude of the specific project.
- Each municipality reviews applications for alterations of freshwater wetlands, based on local wetlands regulations. It is not possible to generalize about the process or regulatory thresholds. The state model regulation does not establish performance standards for wetlands, nor does it require specific mitigation. However, the criterion of "no feasible and prudent alternative" is generally applied to any project requiring construction in a wetland.
- Connecticut has adopted the NPDES Stormwater Permit program from the EPA. For any major construction permit, a Storm Water Pollution Prevention Plan and Notice of Intent must be prepared in accordance with state standards and approved by the Connecticut DEP.

Maine

The Maine Department of Environmental Protection (MDEP) is developing a permitting program for major projects which require permits from various DEP bureaus. This program assigns a single project coordinator to facilitate permit sequencing and coordination of the various agencies. Specific permits that would likely be required for a highway project include:

- Maine Bureau of Public Lands – Submerged Land Lease. The Maine Bureau of Public Lands Submerged Land Lease (Title 12, MSRA 558-A) is required for the placement of structures in coastal waters, lakes and tidal waters seaward for mean low water according to regulations at 04A-0239 Chapter 003. All structures erected prior to 1975 are exempt from permitting requirements provided that there is no significant change in the nature of the structure, intensity of use, or increase in area of impact to submerged lands. Structures owned by the State of Maine are also exempt.
- MDEP Water Quality Discharge License. A Water Quality Discharge License would be required under Title 39 MSRA 361-372, 401-452, 464-470, 571, and 611-612 for discharges of any pollutants, silts or sediments to surface waters of the state. This permit would be necessary for any bridge reconstruction that involved work within a waterway and could potentially result in the discharge of sediments or that required dewatering, and for the issuance of Nationwide Permit No. 33 by the Corps of Engineers for bridge repair and No. 26 for construction of the station at Wells.
- MDEP Natural Resource Protection Act (NRPA). Any work performed in or over state-regulated wetlands, including bridge repairs and culvert replacement, requires a permit under the Natural Resource Protection Act. Transportation reconstruction or replacement projects, limited to the improvement of existing facilities to modern design standards and limited to the rehabilitation of state-owned railroads, are exempt from regulation under NRPA. Other Maine DOT projects that involve the maintenance, repair or reconstruction of state transportation facilities are allowed under a General Permit, and require only notification of the Commissioner. Other projects that are

limited to the maintenance, repair or replacement of existing permanent structures, or the placement of rip-rap, are allowed under Permit By Rule (Title 38 MSRA 480-H) and require only notification of MDEP 14 days prior to construction.

Rhode Island

Rhode Island does not have a comprehensive state environmental permitting process. The major environmental permits likely to be required for a highway project are related to wetlands and stormwater management:

- Coastal Resources Management Council (CRMC) regulates impacts to coastal wetlands areas, and consistency with state coastal management plans. The permit process requires filing a Preliminary Determination Form, followed by a formal application. Alteration of coastal wetlands would normally require issuance of a variance, which involves demonstration of public benefit, the lack of reasonable alternatives, and no net loss of wetlands.
- Rhode Island Freshwater Wetlands Act (RIFWWA), RIGL Sect. 2-1-18, regulates any work in freshwater wetlands, floodplains, or jurisdictional wetlands (which may extend up to 200 feet from the edge of a major river). This permit requires submittal of a Preliminary Determination Application, to determine the resource areas affected, and the type and magnitude of impacts. If a finding of significant alteration is made, a Formal Application must be submitted. Although this permit is issued by the state, affected municipalities have veto power for multi-town transportation projects.
- Rhode Island has adopted the federal NPDES Stormwater Discharge Permit program, under the RIPDES (Rhode Island Pollutant Discharge Elimination System) program. No application to the EPA is required – rather, a Storm Water Pollution Prevention Plan and Notice of Intent must be submitted to RI DES for review and approval.

2.1.6 Planned Facilities

A preliminary inventory of ongoing and planned highway improvement projects dedicated to improving the capacity of the regional highway system has been conducted for each of the New England states. The projects were identified through review of existing state Transportation Improvement Programs (TIPs) budget estimates, planning documents, and interviews. The information collected represents the most current data available at the time of the investigation. More recent documentation may now be available, and the data summarized herein will need to be updated as the project proceeds.

The data collected have been organized into summary tables on a state-by-state basis. The specific sources for each state inventory are noted on its respective summary table. Major projects in each state are discussed below.

Connecticut

In recent years, the State of Connecticut has completed several major highway projects that have increased the capacity of its regional highway system. Some of the more notable projects include the improvements along I-95 corridor, the Charter Oak Bridge in Hartford, and the Baldwin Bridge replacement in Old Saybrook.

The State of Connecticut is currently involved in either the planning or actual construction of several other interstate highway projects dedicated to increasing the capacity of the regional highway system. Additional improvements to I-95 and I-91 are being engineered that will add capacity by increasing the number of travel lanes in selected areas. The State of Connecticut is also planning for the installation of sophisticated traffic monitoring systems, such as ramp meters and incident management systems, that will improve traffic flow conditions on these major corridors. Travel demand management projects are also being employed as demonstrated by the high occupancy vehicle (HOV) lane extension project on I-84 extending eastward from Hartford.

The State of Connecticut is also planning the upgrade of U.S. Routes 6 and 7 corridors. Planned improvements include widening existing roadways and construction of new roadways to provide increased capacity along these corridors. U.S. 6, a heavily traveled corridor, provides the most direct access from Hartford to Providence; U.S. 7 is the primary north-south corridor in the westernmost portion of the state. Although U.S. 7 does not offer the most direct connection between two heavily populated areas, it does provide an alternative north-south corridor to the heavily traveled I-684 corridor in New York. Several other smaller-scale improvements are planned for U.S. Routes 1, 2, 5, and 202.

Several miscellaneous projects dedicated toward increasing overall capacity are planned for CT Routes 2, 9, 15 (in conjunction with improvements to U.S. 5), and 66. However, unlike the interstate projects and improvements planned for U.S. Routes 6 and 7, these projects are mostly directed at increasing capacity at specific points and along sections of the corridors which experience frequent capacity constraint.

Table 2.4 summarizes the information collected on roadway projects in Connecticut dedicated toward increasing the capacity of the regional highway system.

Rhode Island

The State of Rhode Island has programmed and planned a series of highway projects that will improve the major travel corridors between other more populated areas of the region. These projects are mostly aimed at improving travel along the I-95 corridor, improving travel around Providence, and improving capacity along U.S. 6 toward Hartford. Rhode Island also plans to increase capacity of the highway system between the Providence area and the southern portion of the state toward Newport.

Travelers frequently experience high levels of congestion and long travel times along the I-95 corridor in Providence. Several projects are being planned to divert traffic or increase capacity in this area. These projects include the relocation and upgrade of the I-195 corridor in Providence (currently under environmental review), and various interchange improvements.

Improvement projects have also been planned for U.S. Routes 1, 6 and 44. Improvements to the U.S. 6 corridor are programmed for implementation and Rhode Island will work in conjunction with the U.S. 6 improvements being implemented by the State of Connecticut to improve travel conditions between Hartford and Providence.

Table 2.5 summarizes the information collected on roadway projects in Rhode Island dedicated toward increasing the capacity of the regional highway system.

Massachusetts

The major effort in the Commonwealth is Boston's Central Artery/Tunnel (CA/T) project. This project represents the single largest public works project in the United States today, and one of the largest in the world. When complete, north-south travel through the city will be significantly improved. Regional travel to Boston's Logan Airport will also be significantly improved with the extension of the Massachusetts Turnpike under the Boston Harbor to East Boston. Benefits of the project are expected to begin in 1995 as the new tunnel opens for commercial vehicles. Completion of the project is expected in the year 2004.

Several other projects to improve the regional highway system are underway or are in the planning stages in Massachusetts. The commonwealth is planning for the construction of an HOV lane on I-95/MA 128 along the section between I-95 in Canton and MA 9 in Wellesley. A major capacity improvement project, adding two travel lanes to the existing four, is planned for U.S. 3 between MA 128 and the New Hampshire border. In the Boston area, the Executive Office of Transportation and Construction (EOTC) has recently completed an evaluation of Intelligent Vehicle Highway System (IVHS) applications in the region. Early implementation of these efforts are under consideration on I-93 north of Boston and along the I-95/128 corridor. Also in process is the development of an upgrade plan for U.S. 44 which connects Plymouth to Brockton. HOV efforts are being planned for I-93 north of the city where a carpool lane currently exists and is being planned for extension. Also under review is a plan to implement a high-occupancy vehicle lane on the Southeast Expressway (I-93) between Boston and Braintree. A major upgrade to MA 146 between the City of Worcester and the Massachusetts Turnpike is planned as well.

Two other longer range projects that will increase capacity on the regional highway network are being developed and are proposed for further evaluation. These projects include an upgrade of MA 2 between Fitchburg and Greenfield to address safety and capacity problems, and an improvement project along MA 7 in the Berkshires.

Table 2.6 summarizes the information collected on roadway projects in Massachusetts dedicated toward increasing the capacity of the regional highway system.

Maine

Most efforts aimed at increasing capacity of the regional highway system in Maine are focused on the U.S. Routes 1 and 1A corridors. A major study evaluating possible travel demand management (TDM) measures for much of the U.S. 1 corridor in central and southern Maine was recently completed. Implementation of many of the recommendations

of the study is expected to occur beginning in 1994. Emphasis on TDM strategies in Maine has followed referenda on increasing the capacity of the Maine Turnpike south of Portland (defeated) and on the Sensible Transportation Act (passed) discussed in more detail in Chapter 9.0. Other capacity improvement measures are mostly directed at relieving congestion, particularly during the summer months, at various points along U.S. Routes 2 and 302, and ME Routes 25 and 25B.

Table 2.7 summarizes the information collected on roadway projects in Maine dedicated toward increasing the capacity of the regional highway system.

New Hampshire

New Hampshire is currently involved with the construction or planning of several major capacity and safety improvement projects. The most prominent of these projects are centered on the improvement of NH 101 in the Epping and Brentwood area. For many years, this section of roadway has been the subject of discussion for improvements due to its high accident rate. U.S. 101 serves as an important east-west connector between the coastal areas of New Hampshire (Portsmouth/Hampton) and Manchester. The improvements programmed for this corridor will result in a major improvement in the safety conditions and capacity of the highway system in this area of New England.

New Hampshire is also in the process of programming new roadways that will be designed to relieve congestion and increase the capacity of the state's highway system. These projects will involve the construction of a new bypass road along NH 101A around Milford and Nashua, a new bypass along NH 9 around Hillsborough, and a new bypass along NH 12 around Troy Village.

Other highway improvements planned to increase capacity on state highways are being developed for U.S. 3 in Meredith, Lancaster and Concord; U.S. 302 from Bath to Lisbon; NH 16 in Conway, Albany, Ossipee, and Dover; NH 51 in Exeter and Hampton; the Spaulding Turnpike in Dover, Rochester, and Somersworth; and several improvements to the F.E. Everett Turnpike in Hudson, Nashua, Bedford and Manchester areas.

Table 2.8 summarizes the information collected on roadway projects in New Hampshire dedicated toward increasing the capacity of the regional highway system.

Vermont

Vermont has planned, and in some cases begun construction of, several projects that will increase the capacity of the regional highway network. These projects include the construction of three new interchanges on I-89 in Bolton, Colchester, and Williston. The interchanges in Colchester and Williston will provide access to the Chittenden Circumferential Highway. The purpose of these improvements is to enhance mobility by improving highway functionality; Vermont has minimal highway congestion.

A series of improvements leading to increased system capacity are planned for Routes 2, 4, 7, 9, 78 and 103. These improvements include construction of additional lanes, and projects to ease congestion and improve traffic flow such as sophisticated signalization systems. A

relocation of U.S. 2 is also planned around East Montpelier to relieve downtown congestion. A relocation of VT 9 is also planned around Marlboro-Brattleboro.

Vermont also has a bypass program for the construction of two-lane facilities to divert traffic around urban centers and built with access covenants to help local governments protect against sprawl development.

Vermont is interested in the establishment of a Scenic Byways Network in the northeast.

Table 2.9 summarizes the information collected on roadway projects in Vermont dedicated toward increasing the capacity of the regional highway system.

2.1.7 Implications for Next NETI Tasks

The extensive NETI National Highway System GIS being developed as part of the inventory tasks will be used in forecasting future traffic conditions in NETI Task 3. Information on likely growth rates in traffic will be obtained from the state departments of transportation and used to project future traffic volumes and analyze potential capacity problems. A list of likely transportation improvements developed as part of Task 2 will be refined in Task 3. Transportation improvement opportunities will be developed further in Task 4 as will project goals and objectives. The preliminary listing of key highway system issues in Section 2.1.1 will be expanded and refined based on extensive involvement of the various NETI committees in Task 5.

It should be noted that national policy is moving toward the establishment of a single intermodal national transportation system.

■ 2.2 Intercity Buses

2.2.1 Key Issues/Focus

After a review of carrier and schedule information, presented in the next section, bus routes and major bus activity centers have been identified. These locations, or hubs, are the termini for several routes and provide the opportunity to transfer to other intercity routes. Boston, accessible by bus from most other cities in New England, serves as the central hub of intercity bus activity for the entire region. In northern New England, White River Junction, on the New Hampshire/Vermont border is a transfer point for services from the north feeding south into Boston and Springfield. In southern New England, Providence, RI, and Hartford, CT, serve as major hubs funneling service east to Cape Cod, north to Boston and Springfield and south toward New York City. Smaller hubs include Concord, NH, Bangor, ME, and Springfield, MA.

Routes of the eight major intercity bus carriers in New England are shown in Figure 2.3.

Intercity bus service has recently been defined by the Federal Transit Administration as ".regularly scheduled bus service for the general public which operates with limited stops over fixed routes connecting two or more urban areas not in close proximity, which has the capacity for transporting baggage carried by passengers and which makes meaningful connections with scheduled intercity bus service to more distant points, if such service is available. Package express service may also be included, if incidental to passenger transportation. Commuter service (service designed primarily to provide daily work trips within the local commuting area) is excluded from the definition. Intercity service is not limited by the size of the vehicle used or the identity of the carrier. Air, rail, and water service are not included."

In the past three decades, intercity bus service has been on the decline. In 1963, 30 percent of the national intercity travel market was retained by buses. By 1981, this portion dropped to 12 percent. In 1982, the Bus Regulatory Reform Act reduced the authority of the Interstate Commerce Commission and state agencies and allowed bus companies greater flexibility to set fares, enter markets and discontinue unprofitable service. Subsequent to the 1982 Act, a variety of state assistance programs within New England were established to ensure the continuation of key bus service. Maine, Vermont, Massachusetts and Rhode Island provide operating assistance programs. Vehicle assistance is provided by Maine and Massachusetts to carriers, primarily through reduced cost leasing and long-term purchases. Massachusetts is currently the only New England state which provides assistance for building and remodeling bus terminals.

The bus market continued to weaken throughout the country, however, with less than 6,000 locations being served in 1991, compared with 17,000 locations in 1968 and 12,000 locations in 1982. In 1987, Greyhound bought Trailways increasing its national market share, but in 1990 encountered difficulty with a lengthy driver strike and subsequent bankruptcy. A \$22 million settlement was rendered with the drivers. In 1991, the company reentered the market with fewer routes and buses, creating an opportunity for other carriers to enter the market.

Also in 1991, federal funds were first made available for rural intercity bus service through the ISTEA Section 18 program. Section 18 requires states to designate five percent of 1992 federal funds to the improvement of intercity bus service. This amount increases to 10 percent for 1993 and to 15 percent for 1994 and years thereafter. Funds will be available to plan and market intercity bus routes, build shelters and joint-use stops and depots, and coordinate rural connections between small transit operations and intercity bus carriers. Other capital and operating projects that support rural intercity bus service will also be eligible. Spending of these funds is not required if the Governor certifies that "the intercity bus service needs of the state are being adequately met."

Under the American with Disabilities Act (ADA), which requires equitable accessibility to transportation facilities for the disabled, motorized coach carriers will be required to make their vehicles totally accessible by 1997. Proponents anticipate that the ADA will enhance the connections between local transit systems and intercity bus services.

2.2.2 Methodology

Through both a review of existing bus schedules and telephone interviews with various persons connected with the intercity bus industry, a profile of available service was developed as presented in the next section. Contacts and documents are listed at the end of this chapter.

2.2.3 Existing Service in New England

Maine

Of the New England states, Maine has the fewest intercity bus options available, with most service concentrated between Bangor and Portland with continuation into Boston. Maine is served by three private carriers – Cyr Bus Line, Greyhound/Vermont Transit, and Concord Trailways. The most extensive service is provided into Boston, with Bangor functioning as a transfer point between service in northern Maine and those in southern Maine. All bus service south of Portland operates on the Interstate 95 corridor toward Boston, without any east-west connections into New Hampshire.

Cyr Bus Line operates the only bus route in northern Maine, with one daily round trip from Caribou to Bangor with 15 intermediate stops. In Bangor, the traveler has a choice of seven daily round trips to Portland and Boston. Concord Trailways provides three daily express round trips to Boston via Portland. An additional round trip is made daily to Portland and Boston with local service through Maine coastal communities including Belfast, Damariscotta, Wiscasset and Bath. Greyhound/Vermont Transit Lines operates service between Bangor and Boston via Portland with three daily round trips servicing inland communities including Waterville, Augusta, Lewiston, and Brunswick.

Vermont Transit also provides limited summer service between Bangor and Bar Harbor, ME.

New Hampshire

Unlike Maine, where service is concentrated along one major coastal corridor, service in New Hampshire is distributed into more of a network system, creating interstate transfer opportunities in Concord and Manchester. White River Junction, VT, located near Hanover in central New Hampshire is also a major transfer location in the bus system.

Concord Trailways is the sole carrier in northern New Hampshire, providing two daily round trips between Littleton and Boston via Interstate 93 with intermediate stops in Lincoln, Plymouth, Concord and Manchester. Further east, service through Berlin and Conway via the Route 16/Route 104 corridor also travels along Interstate 93 into Boston with the same intermediate stops. Three daily round trips run between Conway and Boston, with one trip available north to Berlin. A total of 18 daily round trips are available between Concord and Boston on Concord Trailways.

From the northwest, Greyhound/Vermont Transit offers six daily round trips from Burlington, VT, via White River Junction, serving Manchester and continuing on Interstate 93 to Boston. White River Junction, which is a hub for much of Vermont's intercity bus service, serves as the gateway connection into New Hampshire.

In southern New Hampshire, two daily round trips are provided by Greyhound/Vermont Transit from Vermont through Keene, NH with Massachusetts stops at Winchendon, Gardner and Boston.

C&J Trailways provides service between Durham/Dover (located immediately northwest of Portsmouth) south through Portsmouth and Newburyport into Boston. A total of 15 round trips are available daily.

Vermont

While service in Maine and New Hampshire is somewhat dominated by the Boston market, Vermont intercity bus routes are focused on the north-south corridors which exist in western New England. In western Vermont, the Interstate 89/Route 7 corridor connects Montreal, Burlington, Pittsfield, MA, and Danbury, CT. In eastern Vermont, Interstate 91 traces the Connecticut River Valley along the New Hampshire border and continues through Springfield, MA and Hartford, CT, into New York City.

Vermont is served by Greyhound/Vermont Transit with major connections provided at White River Junction, Burlington, and Rutland. Bonanza Bus Lines provides service between Bennington and towns along the Route 7 corridor in western Massachusetts, Connecticut and continuing into New York City. Major stops include Pittsfield, MA, Great Barrington, MA and Danbury, CT. Peter Pan also provides service from Bennington, VT to Boston via Route 7 and the Massachusetts Turnpike (I-90) with major stops in Williamstown, North Adams and Springfield.

White River Junction, which is the major connection point for Vermont's intercity bus activity, serves as the gateway into New Hampshire and Boston. From Burlington, five daily round trips are provided through White River Junction into Boston. Four daily round trips are available from Burlington through White River Junction to Springfield, MA with continuing service into Hartford, CT, and New York City.

In addition to the east-west connection provided between Burlington and White River Junction, other cross-state connections include one daily round trip between Rutland and White River Junction via Route 4. A more southern cross-state route is provided by two round trips between Rutland, Bellows Falls, Keene, NH, Gardner, MA and Boston, MA.

Along the western Interstate 89/Route 7 corridor, three daily round trips are run between Burlington, Rutland and Bennington, with continuing service west to Albany, NY. In Albany, connections can be made to Syracuse, Buffalo and New York City.

In northeast Vermont, one daily round trip is provided from Newport to White River Junction. Two daily round trips are provided from Burlington, VT into Montreal.

Massachusetts

Massachusetts is served by five major intercity bus carriers. In eastern Massachusetts, Boston serves as both a major terminus and a transfer point for numerous intercity bus routes connecting much of the service from northern New England with those to the south. Major routes from Maine and New Hampshire to the north, Springfield to the west and Providence to the south, converge in Boston. The 1994 completion of the South Station Transportation Center in Boston will provide a common terminal for these services and adjoining access to Northeast Corridor Amtrak and MBTA commuter rail service. (A discussion of service provided by Greyhound/Vermont Transit and Concord Trailways from northern New England into Massachusetts is presented in the sections for Maine, New Hampshire and Vermont.) Greyhound provides through service from Boston to Hartford and New York City.

In central Massachusetts, Amherst serves as a hub for Peter Pan bus operations. Seventeen round trips are available between Amherst and New York City with major intermediate stops in Springfield, MA, and Hartford, CT. Limited connections north to Greenfield are also available from Amherst. Sixteen round trips are available between Amherst and Boston, with stops in Springfield and Worcester. In Springfield, with its central location on the Massachusetts Turnpike, four daily round trips are available west to Albany and east to Boston. Springfield is also a major stop on both the north-south routes serving Vermont through to Connecticut. One daily round trip is provided between Springfield and Providence via Worcester. Twenty-five daily round trips are provided by Peter Pan between Worcester and Boston, 25 percent with an intermediate stop at Framingham.

In the central and western parts of the state, service is provided primarily along three corridors. East-west service is provided via the Massachusetts Turnpike (I-90) linking points west to the Boston area. Two north/south corridors exist – one along Route 7 which provides service from Vermont through Pittsfield and south into Connecticut and one along Interstate 91 which is the primary connection between points in Vermont and Maine and Springfield.

Within Massachusetts, Plymouth and Brockton (P&B) extensively serves the South Shore and Cape Cod with commuter and intercity service. Twenty-five limited express (three intermediate stops) daily round trips are provided between Hyannis and Boston. Fifteen daily round trips operate between Plymouth and Boston with intermediate stops at Kingston, Duxbury, Hanover, Norwell and Rockwell. Two daily round trips are operated between Provincetown and Boston with 17 intermediate stops. Additionally, Plymouth & Brockton provides commuter service into Boston from Pembroke, Marshfield, Hanover, and Brockton. Many other smaller carries also provide local commuter services.

Bonanza operates numerous routes from Providence, RI into southern Massachusetts, including seven daily round trips serving Fall River, New Bedford and Hyannis. Ten round trips operate daily between Woods Hole, Falmouth and Boston. Seven daily round trips are available between Newport, RI, through Fall River and into Boston. Five daily round trips operate between Wareham and Boston. Many Bonanza trips to Boston also service Logan International Airport.

The Bonanza service to Woods Hole provides direct transfer to the Steamship Authority's ferry service to Martha's Vineyard. The Authority provides 14 daily round trips between Woods Hole and the Vineyard, between late May and early November. In Hyannis, Bonanza service provides a connection to the Steamship Authority's ferry service to Nantucket Island. Three to six daily round trips are provided to Nantucket depending on the season.

Bonanza also operate routes in the western portion of the state along the Route 7 corridor connecting Bennington, VT, with Williamstown, Pittsfield, Great Barrington and continuing into western Connecticut and New York City. Two trips operate from Bennington, with a total of four daily trips running from Pittsfield. From Pittsfield, service west to Albany is provided twice daily.

Rhode Island

A map of intercity bus routes in Rhode Island is akin to a wheel and spokes, with the hub centered in Providence and service provided radially in five directions. Bonanza Bus Line is the only intercity bus carrier in the state.

To the northeast, 19 daily express round trips operate between Providence and Boston and Logan International Airport with an intermediate stop at Pawtucket, RI. Service to the northwest, twice daily, is provided to Springfield, MA, Pittsfield, MA and continuing service to Albany.

To the west, four daily round trips are available between Providence, Hartford, CT and Danbury, CT with continuation into New York City. Non-stop service to New York from Providence is also provided along Interstate 95. This non-stop service originates in Boston. Providence is a major stop on the busy Boston-New York City corridor.

Service to the east is provided by seven daily round trips between Providence and Hyannis, MA with stops at Fall River and New Bedford. Connecting service is available to Bourne and Woods Hole, MA. From Hyannis, connections are available to eastern Cape Cod locations including Orleans, Eastham and Wellfleet. From Hyannis and Woods Hole, connections are available to ferries serving Martha's Vineyard and Nantucket Island.

Connecticut

As with Providence in Rhode Island, Hartford is the hub of Connecticut's bus activity. From Hartford, direct bus connection can be made north to Springfield, northeast to Boston, east to Providence and southwest to New York City. Service through Hartford is provided by three of the state's four carriers, Bonanza, Greyhound and Peter Pan, along five radial corridors. Non-stop service between Providence and New York City travels along the I-95 corridor in southern coastal Connecticut.

Bonanza operates eleven daily round trips between Hartford and New York City, four of which also serve Providence, RI. Peter Pan also provides daily service from Amherst, MA, through Hartford and into New York City with 20 round trips, half of which run express, the other half make intermediate stops. Greyhound operates three daily round trips

between Hartford and Stamford with intermediate stops at New Britain, New Haven and Bridgeport.

Arrow Lines recently reduced most of its fixed intercity routes and established charter bus service and shuttle services as its primary business focus but continues to maintain four daily round trips between Hartford and the University of Connecticut at Storrs. The major reason for their withdrawal from the market was low ridership.

In western Connecticut, Bonanza provides four daily round trips along Route 7 from points north in Massachusetts through to Danbury and continuing south into New York City.

Connecticut has studied the ISTEA implications for intercity service and indicated that private carriers were not interested in obtaining the available ISTEA funds (statewide: \$48,000 in FY 1992 and \$84,000 in FY 1993) since the amounts are relatively small and they would become subject to additional state regulations. Connecticut decided to spend the money to construct bus shelters, increase signage at bus stops, and increase availability of private carrier schedules.

2.2.4 Implications for Next NETI Tasks

Bus travel is usually one of the most cost effective modes of travel. For many areas, particularly in northern New England, it is the only viable alternative to the automobile for intercity travel. The availability of easy intermodal transfers at the bus hubs contribute to the attractiveness of bus travel. The South Station Transportation Center in Boston, for example, will provide convenient transfers between bus and rail, and to Logan Airport on high occupancy vehicle (HOV) lanes following the 1995 opening of the Third Harbor Tunnel. Additional opportunities for providing this transfer activity between bus and other modes should be further addressed in upcoming NETI tasks.

Additional information on the current use of ISTEA funding by individual states for intercity bus travel should be obtained to determine which features of intercity bus service need improvement. The role of intercity bus service vis-a-vis high speed rail transportation is likely to emerge as a critical intermodal issue in coming years. The rail service will operate along the most profitable remaining bus corridors further squeezing bus company profits and leading to further pressure for route abandonment in rural areas in a process that has been on-going for the past decade.

■ 2.3 Motor Carrier Regulations

2.3.1 Introduction

This chapter focuses on motor carrier regulations in New England. Working within the framework set up by the federal government, each state has developed regulations which guide the process for the registration and operation of motor carriers. Despite federal guidelines, regulations vary by state. Motor carrier administration operates under different authorities. The permitting process, size/weight standards and insurance and tax guidelines are also not standard. This section outlines and briefly describes these differences.

2.3.2 Background

Until the early 1930s, truck movements were local. Concerns about road construction costs and taxation to pay for repairs were local and state issues, and regulations governing motor carriers were tailored to the needs of the local economy and geography. By World War II, the situation had changed dramatically. Better truck engines, more sophisticated paving techniques, and public investment in roadways gave trucks greater range and capacity, permitting business and industry to locate away from railroads and ports. As businesses expanded their markets, truck operations expanded along with them. Interstate motor carrier operations became more commonplace, providing relatively uniform freight service across the United States, but motor carrier regulation remained "balkanized" as motor carriers were subject to regulation by every state through which they passed.

By the 1960s numerous efforts were made to standardize equipment, permitting, and tax reporting for trucks in interstate operation. Most of these efforts had limited effect since states were concerned about protecting their own business traditions and their revenues. The situation had become acute by the 1970s, especially for business and industry, which were serving growing national and international markets and looking for ways to improve productivity and reduce costs. The response was the deregulation of the motor carrier industry in 1980 and the imposition of uniform Federal size and weight standards for trucks operating on the interstate highway system. These actions triggered a massive restructuring of the motor carrier industry and sharp competitive pressures to reduce costs.

2.3.3 Key Issues

Motor carrier regulation in New England today is gradually moving toward a comprehensive, standardized process. Each state is (or soon will be) involved with the International Registration Plan (IRP) and International Fuel Tax Agreement (IFTA). These programs – now mandated by the Federal Intermodal Surface Transportation Efficiency Act – made it possible for motor carriers to conduct vehicle registration and fuel taxation

paperwork and payment transactions for all states in which they do business through a single base-state (usually the motor carrier's home state).

Table 2.10 summarizes the current process for the issuance and inspection of motor carriers, including;

- State Operating Authority;
- IRP, IFTA status;
- Maximum weight standards;
- Insurance requirements; and
- Permits and registration fees.

2.3.4 Summary

Operating authorities in the New England states impose varying restrictions on motor carriers. All states have a maximum weight limit of 80,000 pounds, distributed by axle. Only some of the states allow a tolerance (2 to 10 percent) of higher weights on any given axle. These states require registration fees allocated according to the gross weight of the motor carrier. Varying fuel taxes and insurance requirements prevail.

The process is nevertheless moving toward a federally-mandated integrated system which will minimize paperwork and redundancy. All states except Rhode Island have joined the International Registration Plan, which uses the base state as a source of all registration and transactions. Maine, New Hampshire, and Vermont are members of the Regional Fuel Tax Agreement, which, effectively, functions like IFTA. Connecticut will join IFTA in 1994, and Rhode Island will join in 1996.

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Tables

Table 2.1 Estimated Mileage of Proposed National Highway System (NHS)

State	Proposed NHS Rural	Proposed NHS Urban	Total NHS Mileage
Connecticut	362	614	976
Maine	980	159	1,139
Massachusetts	486	1,373	1,859
New Hampshire	634	158	792
Rhode Island	88	179	267
Vermont	606	79	685
New England	3,156	2,562	5,718
Total U.S.	118,838	39,849	158,687

Source: Federal Highway Administration, Office of Program Development, December 21, 1993.

Table 2.2 NHPN Data Fields Transferred to NHS File

Data Field	Description
State	A number assigned to each state by the FHWA
Route Type	I = Interstate; J = Interstate-related route; U = U.S. route; S = State route
Route Name	Route numbers or names
Length (mi)	Length of link in miles as reported in NHPN file
Toll	T = Toll road; B = Link with toll bridge
Truck Route	A = State designated route for STAA-dimensioned vehicles B = Federally designated National network for large commercial vehicles C = Long-term construction-related restrictions
Access Control	U = Uncontrolled access G = Partially controlled access (with some at grade intersections) I = Fully controlled access; all intersections are grade separated
Median	M= Divided highway with median C = Undivided; i.e.; "centerline"
Number of Lanes	The total number of lanes in both directions

Table 2.3 New Data Fields Added to the NHS File

Data Field	Description
Lane Width	The width of a typical travel lane
AADT Volume	Annual average daily traffic (most recent year) (total volume in both directions)
AADT Year	The year represented by the AADT volume
Accidents 1989	Total accidents on the link (including intersections) in 1989
Accidents 1990	Total accidents on the link (including intersections) in 1990
Accidents 1991	Total accidents on the link (including intersections) in 1991
Design Speed	Measured in miles per hour
Percent Trucks	Percentage of heavy trucks in the vehicle stream during peak hour
PHF	Peak hour factor (ratio of total hourly volume to the maximum 15 minute rate of flow within the hour)
K Factor	Peak hour volume divided by ADT
Directional Split	Percentage of traffic traveling in peak direction during the peak hour
Development Environmental	U = Urban; S = Suburban; R = Rural

Table 2.4 State of Connecticut – Major Projects Planned on NHS Roadways

NHS Number	Segment Number	State Project Number	Year	Distance (mi.)	Commitment	Estimated Cost (000s)	Description
I-95	11500	0135-0200		2.2		\$30,584	Add a lane to southbound direction in Darien and Stamford; study impacts of ramp meters
	11500	0173-H018				\$14,500	Install incident management system along I-95 in Greenwich, Stamford, and Darien
	11420	0092-0433		5		\$720	Prepare Preliminary Engineering plans for ramp metering of southbound on-ramps at interchanges 50,51,52,53,54 & closure of Stiles Street on-ramp
	1137?	0092-0354		5		\$3,450	Prepare EIS for new crossing over New Haven Harbor on I-95 from Exit 43 to Exit 52
I-91		0118-H011				\$3,500	Widen I-91 northbound from Exit 23 to Orchard Street Overpass
		0063-0458		0.5		\$27,082	Widen and resurface I-91 northbound and southbound from Great Meadow Street to Airport overpass including rehab of 5 bridges
I-84	10170	0042-H009		100		\$23,829	Extend Existing HOV lanes in East Hartford to and from the city of Hartford via Founders Bridge
US-1		0014-H019 0102-0256 0173-H109 0173-H205		—		\$1,040	Miscellaneous widening, reconstruction, capacity improvements in Branford, Norwalk, Greenwich, Stamford, Stratford, and Milford
CT-2	10680	0001-0090		37.8		\$34,000	Upgrade Expressway from Founders Bridge to Route 169. Includes upgrade of CT-2/CT-32 Interchange
US-5/ CT-15	10690	0159-0170				\$1,650	Widen Routes 5 and 15 to a 3-lane section in each direction from Route 175 to Nott Street
US-5	10150	0132-0116				\$3,104	Miscellaneous reconstruction and improvements in S. Windsor, E. Windsor, Ellington, and Glastonbury
	10150	0171-H018				\$354	
	10150	0171-H019				\$595	
US-6		0012-0081		3.6		\$82,069	New Expressway from Parker Bridge Road to Route 66 interchange
		0012-0086		3.3		\$88,471	New Expressway from I-84 in Bolton to Swamp Road in Coventry
	10300	0032-0114		4.4		\$99,209	New Expressway from Swamp Road in Coventry to Parker Bridge Road in Andover

Table 2.4 State of Connecticut – Major Projects Planned on NHS Roadways
(continued)

NHS Number	Segment Number	State Project Number	Year	Distance (mi.)	Commitment	Estimated Cost (\$000s)	Description
US-6	10300	0019-0086		?		\$1,195	Miscellaneous widening, reconstruction, and relocations of Route 6 in Coventry, Bolton, Columbia, Brooklyn, Windham, and Chaplin
	10490	0012-0092		1.8		\$9,825	
	10500	0019-0093		1.3		\$7,274	
	10450	0019-0094		1.9		\$13,470	
		0019-0096		0.4		\$88	
		0163-0141		4.3		\$24,481	
US-7		0102-0220		2.3		\$107,465	New Expressway from Grist Mill Road in Norwalk to existing US 7 in Wilton
		0116-0084		2.7		\$20,225	
							New Expressway from Danbury/Redding townline to Old Sugar Hollow Road
	11470	0102-H012				\$60,000	
	11450	0117-H002				\$2,452	Miscellaneous reconstruction, widening and upgrading in Norwalk, Ridgefield, and Wilton
	11450	0161-0118		1		\$17,732	
US-202	11450	0161-H003				\$2,200	
	11450	0161-H004		1.1		\$4,445	
US-202	10730	0073-0153		0.1		\$179	Miscellaneous widening and improvements in Litchfield
	10730	0073-0154				\$493	
CT-2	10860	0103-0219		0.6		\$13,870	Miscellaneous reconstruction in Norwich
CT-9	10320	0170-H084				\$121,711	Upgrade Expressway in Middletown by eliminating at-grade intersections
	10770	0118-0139				\$132	
CT-15	11140	0148-H004				\$4,068	Miscellaneous improvements in Wallingford and Westport
	11440	0158-H086				\$9,392	
		0170-H086				\$42,306	Expressway upgrade and prepare EIS for southwest corridor upgrade
CT-66		0081-0080		2		\$13,374	New highway between terminus of I-691 and Jackson Hill Road

Note: Information in table may not be current and is subject to change.

Source: Master Transportation Plan, Connecticut Department of Transportation, February, 1993.

Table 2.5 State of Rhode Island – Major Projects Planned on NHS Roadways

NHS Number	Segment Number	State Project Number	Year	Distance (mi.)	Commitment	Estimated Cost (000s)	Description
I-95	50070				Programed		I-95 on-ramps in Providence between Thubers Avenue I-195, both southbound and northbound.
I-195	32820				Planned (short-range)		Relocate I-195; improve capacity and safety conditions in Providence
					Planned		Eliminate Dyer Street interchange in Providence to improve safety and capacity conditions
US-1/ RI-78					Programed		Improvements to US-1 interchange
US-6	50230 50100				Programed		Upgrade from the Connecticut state line to I-295 in Johnston
US-44					Planned		New Red Bridge Extension in East Providence. Will provide improved east-west travel alternative to I-195
Quonset Point/ Davisville Connector Road					Programed		Quonset Access Road in East Greenwich and North Kingstown. New limited-access road designed to address severe capacity deficiency. Will connect to RI-4 and I-95
RI-146	50080				Planned (long-range)		Widen to three lane sections both northbound and southbound and provide limited access from Providence to RI-146A

Source: Transportation 2010: Ground Transportation Plan, State Guide Plan Element 611, Rhode Island Department of Administration, Division of Planning, March 1992.

Note: Information in table may not be current and is subject to change.

Table 2.6 Commonwealth of Massachusetts – Major Projects Planned on NHS Roadways

NHS Number	Segment Number	State Project Number	Year	Distance (mi.)	Commitment	Estimated Cost (000s)	Description
I-93/					Programmed	> \$7,000,000	Central Artery/Tunnel, Depress Boston's Central Artery and construct extension of I-90 under Boston Harbor from South Boston to East Boston
I-95/ MA-128	30660/31110 30700/30770						Add HOV lanes
I-93	31680				Programmed		Add HOV lanes to Southeast Expressway and to the north of Boston
US-3	30310 30320 30900				Programmed		Upgrade Route 3 from I-95/RT-128 to New Hampshire border
	32280				Planned		Add additional capacity and/or HOV lanes to Route 3 south of Route 128
US-7							
MA-2							
MA-146							

Source: Statewide Transportation Improvement Program (Draft), Executive Office of Transportation and Construction, Commonwealth of Massachusetts, February 1993.

Note: Information in table may not be current and is subject to change.

Table 2.7 State of Maine – Major Projects Planned on NHS Roadways

NHS Number	Segment Number	State Project Number	Year	Distance (mi.)	Commitment	Estimated Cost (000s)	Description
US-1		5659.00				\$30	Installation of fully-actuated traffic signals, signage and striping at various intersections in Arundel & Scarborough
		5660.00				\$30	
		5882.00				\$100	
US-1A		5658.00				\$30	Miscellaneous system management and operational improvements in Fort Fairfield, Brewer, Hampden, and Portland
		5853.00				\$275	
		5875.00				\$30	
US-2		5851.00				\$60	Miscellaneous system management and operational improvements in Bangor
US 302		5884.00				\$580	Miscellaneous system management and operational improvements in Westbrook
ME-25/ ME-25B		5885.00				\$40	Miscellaneous system management and operational improvements in Westbrook
		5886.00				\$30	

Source: Multi-Modal Transportation Improvement Program, Maine Department of Transportation, May 1993.

Note: Information in table may not be current and is subject to change.

Table 2.8 State of New Hampshire – Major Projects Planned on NHS Roadways

NHS Number	Segment Number	State Project Number	Year	Distance (mi.)	Location	Estimated Cost (000s)	Description
Spaulding Turnpike	40320	10619	1994		Dover	\$1,000	Toll - Expand to 8 lanes
	40320		1994		Dover - Rochester	\$3,775	Construct new Exit 10
	40320	10023-C	1994		Dover - Somersworth	\$400	Reconstruct Weeks Circle
Everett Turnpike		10625-E	1994		Hudson	\$6,900	Construct Circumferential Highway SB NH 3A to Second Brook
		10625-H	1994		Hudson	\$17,600	Construct Circumferential Highway SB Earth 2nd Brk. to Kimball Hill
	40520	10623-C	1994		Nashua	\$23,000	Central Turnpike Widening Exits 3 & 4
	40520	11057-A	1994		Nashua	\$2,600	Central Turnpike Widening Rest Area Reconstruction
		10624-G	1994		Nashua	\$18,250	Construct 6 Ramps
		10625-B	1994		Nashua-Hudson	\$11,500	Circumferential highway SB construct Merrimack Bridges
	40450	10622	1995		Nashua-D.W. Highway	\$12,700	Widen from I-293 to Amoskeg interchange
	40520	10623	1995		Bedford-Manchester	\$41,635	Central TPK widening from Exit 3 to 7
		10625-C	1996		Nashua	\$6,000	Circumferential Highway SB construct bridge over NH 3A
		10625-D	1996		Hudson	\$20,000	Circumferential Highway SB Earthwork and pavement from Merrimack River to NH 3A
		10625-G	1996		Hudson	\$4,000	Circumferential Highway SB bridges: Musquash, Bush Hill, & Spear
		10625-I	1996		Hudson	\$9,550	Circumferential Highway SB Earth 2nd Brk. to Bartlett hill
Circumferential Highway	40520	10624	1996		Nashua-D.W. Highway	\$480	Construct Exits 1 & 2
		10625-K	1995		Hudson	\$5,000	Construct bridges over NH 111, Kimball HL RD & Ped Overpass
US 3		11386	1997		Meredith	\$2,500	Reconstruction from Parade Rd north to US 3/NH 25
		10435	1999		Lancaster	\$900	Reconstruct 0.6 mi. from US 2
		C3311	1997		Concord	\$7,100	Reconstruct US 3 from Black Hill Rd to Perley St.
US 302		10425	1998		Bath-Lisbon	\$5,000	Reconstruction from NH 112 to Lisbon (8.89mi.)
		10425	2001		Bath-Lisbon	\$20,000	Reconstruction from NH 112 to Lisbon (8.89mi.)
NH 9	40440	10440	1996-1997		Hillsborough	\$30,000	Construction of a Bypass around Hillsborough
NH 12		10434	1998		Troy-Marlborough	\$4,000	NH 12 Bypass of Troy Village
NH 16		11339	1999		Conway	\$8,300	NH 16 reconstruction to relieve traffic from NH 112 to Lower Bartlett
40190		10437	2000		Albany	\$7,600	Reconstruct NH 16 just north of Madison TL south 3.79 mi.
		10431	2000		Ossipee	\$4,300	Reconstruct from NH 28 north of NH 16 3.36 mi.
		10023-B	1994		Dover	\$1,043	Reconstruct Week's Traffic Circle
		10023-C	1994		Dover	\$5,000	Reconstruct Week's Traffic Circle
NH 51		10423-G	1999		Exeter-Hampton	\$9,000	NH 51, widen NH 101 to I-95 rehabilitate EB NH 51 (NH 88-Towle Farm Rd)
		10423-H	1999		Hampton	\$4,000	NH 51, widen NH 101 to I-95 Reconstruct EB bridge NH 51/I-95
NH 101	40370	11533-B	1994		Brentwood	\$1,250	Relocate and widen NH 101 & modify North Rd. / NH 101 Bridge
	40370	10074-E	1994		Epping	\$11,000	Reconstruct & major widening EB Barrel Raymond - Martin Rd Beede Hill Rd Bridge / NH 101

Table 2.8 State of New Hampshire – Major Projects Planned on NHS Roadways
(continued)

NHS Number	Segment Number	State Project Number	Year	Distance (mi.)	Location	Estimated Cost (000s)	Description
NH101 (cont.)	40370	10074-F	1994		Epping-Brentwood	\$8,000	Reconstruct & major widening WB Barrel - Martin Rd Brentwood
	40370	10074-G	1994		Epping	\$2,000	Martin Rd over NH 101
	40390	10423-B	1994		Exeter	\$1,340	Guinea Road & Bridge over NH 101
	40390	10422-I	1994		Exeter-Stratham	\$5,000	EB Bridge over Squamscott
	40390	10423-C	1994		Hampton	\$1,100	Towle Farm Road & Bridge over NH 101
	40390	10421	1994		Stratham-Exeter	\$2,500	Reconstruction - NH 101 PE & ROW, NH 51 Interchange
	40390	11533-A	1995		Brentwood-Exeter	\$2,900	Pine Road & Bridge over Little River (NH 101 EB & WB Bridge)
	40390	10421-A	1995		Exeter	\$3,000	Reconstruction - NH 101 Bridges 101 WB over NH 108
	40390	11533-F	1995		Exeter	\$5,720	Relocate of NH 27 thru NH 51 & Watson Rd Relocate, Bridge over Bloody Bank
	40390	11533-H	1995		Exeter	\$1,600	WB & EB Bridge over Little River E of Pine Rd
	40390	10423-H	1995		Hampton	\$9,000	WB NH 101 from W of I-95 to end work on NH 51
	40370	11533-D	1996		Brentwood	\$14,500	Relocate & widen NH 101 Reloc. North Rd to Pine Rd
	40390	11533-E	1996		Brentwood-Exeter	\$4,800	Relocate & widen NH 101; Relocate Pine to Epping Rd
	40390	11533-C	1996		Exeter	\$2,500	Relocate & widen NH 101 New Bridge Epping Rd / NH 101
	40390	10422-E	1996		Stratham	\$4,800	Rehabilitate EB with RR Bridge overlay WB
	40370	10074-I	1997		Epping	\$4,200	Rehabilitate existing NH 101 for new EB (E of Raymond T/L)
	40370	10074-K	1997		Epping	\$1,400	Reconstruction & major widening new Bridge NH 101 / NH 125 EB
NH 101-A	40390	10421-B	1997		Stratham-Exeter	\$12,000	Reconstruction NH 101 from NH 108 to NH 88
	40390	11533-I	1998		Brentwood-Exeter	\$1,750	Signing, paving, striping
	40370	10074-H	1998		Epping-Brentwood	\$5,000	Reconstruction & major widening Martin Rd - Brentwood TL
	40390	11533-G	1998		Exeter	\$1,000	Epping Rd interchange & EB/WB mainline
	40390	10421-C	1998		Stratham	\$3,000	Reconstruct NH 101 EB over NH 108
	40390	10421-D	1999		Stratham-Exeter	\$3,000	Reconstruct NH 101 EB from NH 108 - NH 88 NH 108 exit ramps
	40390		2000		Keene	\$15,000	Design & construct roadway segments and intersections (NH 9,10,12,101)
		10309	1997		Keene	\$4,000	Reconstruct from Main St Westerly to NH 12
			1997		Bedford	\$4,000	Relocate NH 101 WB on & WB off ramps to US 3 to Kilton Rd
		10309	1997		Keene	\$7,500	Reconstruct from Main St Westerly to NH 12
		11324-A	1994		Epping-Hampton	\$2,000	Reconstruct & widen NH 101
		10136	2002		Milford-Nashua	\$20,000	Construct new road from Milford Bypass to F.E.E. Turnpike
		10136	2003		Milford-Nashua	\$15,800	Construct new road from Milford Bypass to F.E.E. Turnpike
		10136	1995		Milford-Nashua	\$10,000	New route from Milford Bypass to F.E.E. Turnpike
		10136	2002		Milford-Nashua	\$11,700	Construct new road from Milford Bypass to F.E.E. Turnpike
		10136	2003		Milford-Nashua	\$1,700	Construct new road from Milford Bypass to F.E.E. Turnpike
NH 106	40240	10672	1994-1997		Concord-Laconia	\$21,000	From I-393 Northerly to Laconia By-Pass (Acquire ROW and Safety Improvements)
NH 125	40390		1996		Plaistow	\$3,100	Reconstruct from Westville Bridge to Kingston
	40390		1997		Plaistow	\$6,900	Reconstruct from Westville Bridge to Kingston

Source: Statewide Transportation Improvement Program (Draft), New Hampshire Department of Transportation, September, 1993.

Note: Information in table may not be current and is subject to change.

Table 2.9 State of Vermont – Major Projects Planned on NHS Roadways

NHS Number	Segment Number	State Project Number	Year	Distance (mi.)	Commitment	Estimated Cost (000s)	Description
I-89	60130	IR 089-2(10)	1993-1994		New Capacity	\$2,333	Construct new interchange in Bolton
	60040	IR 089-3(11)	1994-1998		New Capacity	\$7,285	Construct interchange in Colchester with Chittenden Circumferential Highway
	60130	IR 089-2(12)	1995-1997		New Capacity	\$8,224	Construct interchange in Williston with Chittenden Circumferential highway
US 2	60140	F EGC-F 028-3(26)C/1	1993-1996	1.39	New Capacity	\$3,040	Reconstruct US 302 in Cabot
	60140	F EGC-F 028-3(26)C/2	1993-1996	1.5	New Capacity	\$1,806	Reconstruct US 302 in Cabot & Danville
	60140	F EGC-F 028-3(26)C/3	1993-1995	1.03	New Capacity	\$1,510	Reconstruct US 302 in Cabot & Danville
	60140	F EGC-F 028-3(17)	1993-1994	1.68	New Capacity	\$6,637	Reconstruct US 2 in Danville
	60140	F EGC-F 028-3(22)	1993-1998	3.62	New Capacity	\$10,627	Relocate US 2 around East Montpelier
	60140	F EGC-F 028-3(28)	1993-1999	5	New Capacity	\$10,206	Reconstruct US 2 in Marshfield
US 7	60270	M 1000(12)	1994-1995		New Capacity	\$44	Construct additional turn lane
	60270	F 019-1(5)	1994-1999		New Capacity	\$31,372	Relocate US 7 around Bennington
	60270	F 019-1(4)	1994-1999		New Capacity	\$3,243	Relocate US 7 around Bennington
	60270	F EGC 019-4(20)	1994-1999		System Preservation	\$2,847	Rehabilitate / Reconstruct US 7
	60270	CM 0107(9)S	1994-1999	1.35	New Capacity	\$4,029	Reconstruct US 7 in Pownal-Bennington: Improve service, traffic flow
	60270	F 019-1(16)C/2	1996-1997	1.86	New Capacity	\$3,500	Reconstruct US 7 in Pownal-Bennington: Improve service, traffic flow
US 302		M EGC 6000(14)	1994-1998	1.655	Barre City	\$460	Reconstruct US 302 in Barre City
		M EGC 6000(5)	1994-1998		System Management	\$1,422	Rehabilitate / Reconstruct US 302 in Berlin
		MG SGNL(4)	1993		Signal Upgrade	\$202	Install signal upgrades in Berlin
VT 9	60330	RS 0110(1)	1994-1999			\$17,135	Relocate VT 9
	60330	HES 010-1(30)	1993-1995	1.03	System Management		Improve VT 9 alignment in Marlboro-Brattleboro
	60330	F 010-1(25)	1993-1997	0.852	New Capacity	\$6,485	Reconstruct VT 9 near Marlboro-Brattleboro TL
	60330	F 010-1(18)	1993-1996	3.85	New Capacity	\$9,077	Reconstruct VT 9 in Searsburg-Wilmington, including bridges #'s. 24 & 25
VT 125		RS 0172(3)	1994-1998	1.69	New Capacity	\$5,374	Reconstruct VT 125 through Cornwall
		BRZ 1449(18)	1994		Replace Bridge	\$341	Replace BR4 on TH1 in Coventry

Source: Official Fiscal Year 1994 Capital Program and Project Development Plan, Vermont Agency of Transportation, June, 1993.

Note: Information in table may not be current and is subject to change.

Table 2.10 New England Truck Regulations

	Operating Authority	Regulation of Intrastate/Interstate Commerce	International Registration Plan (IRP)	International Fuel Tax Agreement (IFTA)
Connecticut	Connecticut DOT	Both	Yes	Beginning in 1994
Maine	Maine Motor Vehicle Division (Commercial Vehicle Center)	Both	Yes	RFTA
Massachusetts	Massachusetts Department of Public Utilities (Transportation Division)	Both	Yes	No
New Hampshire	New Hampshire Department of Safety (Bureau of Common Carriers)	Both	Yes	RFTA
Rhode Island	Rhode Island Public Utilities Commission (Motor Carrier Section)	Both	No	In 1996
Vermont	Vermont Department of Motor Vehicles	Neither	Yes	RFTA

Table 2.10 New England Truck Regulations (continued)

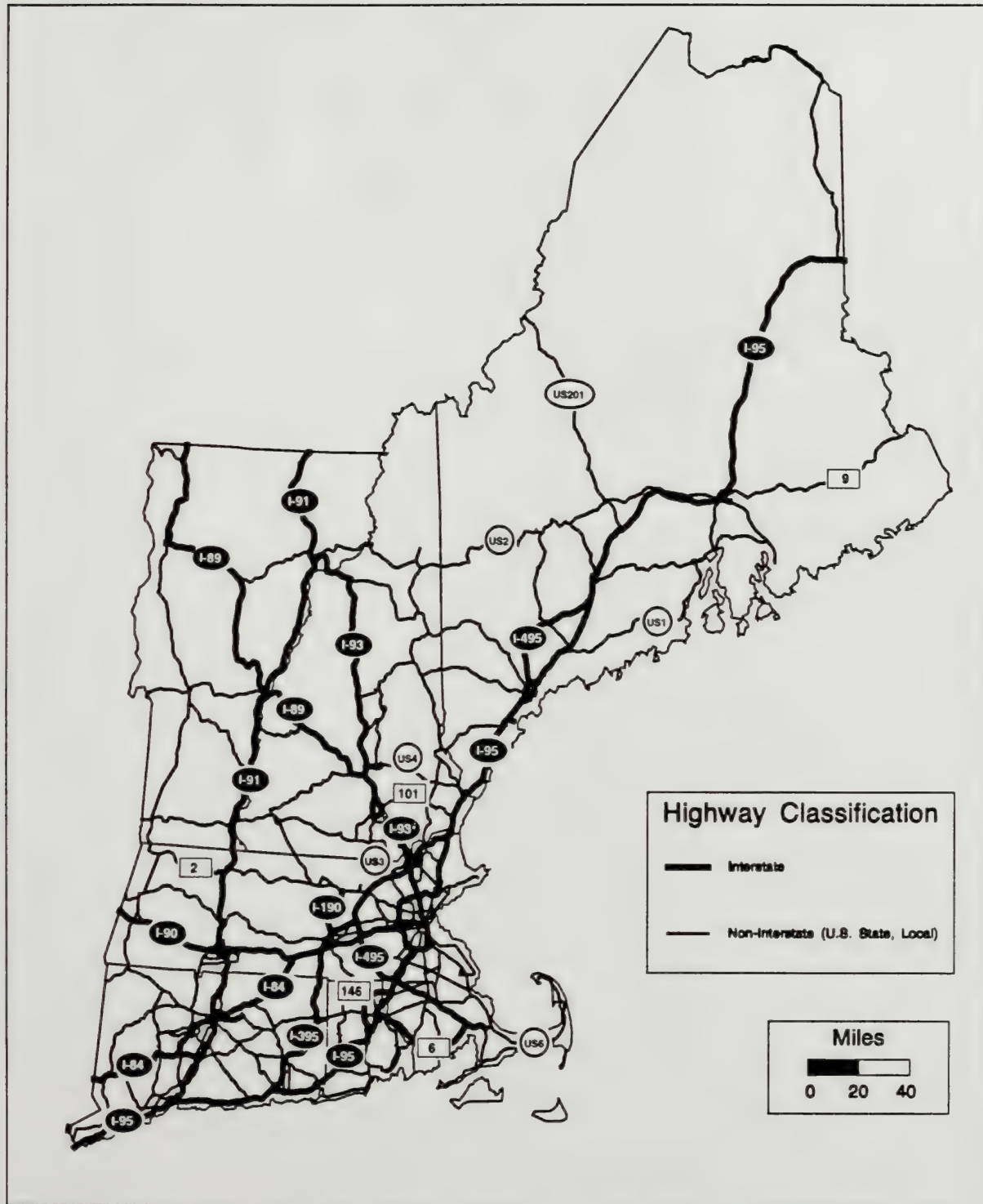
	Maximum Weight Allowed	Weight Tolerance (on any one axle)	Fuel Use Tax (per gallon)		Insurance Requirements
			Gas	Special Fuels	
Connecticut	80,000 lbs.	2%	28¢	18¢	Property Damage: \$100,000 Public Liability: \$200,000/600,000
Maine	80,000 lbs.	No tolerance	19¢	20¢	Property Damage and Public Liability: \$350,000
Massachusetts	80,000 lbs.	No tolerance	21¢	21¢	Property Damage: NA Public Liability: \$10,000/20,000 Cargo: \$1,000 to any one claim or any one load
New Hampshire	80,000 lbs.	5%	18¢	18¢	Property Damage: \$25,000 Public Liability: \$25,000/50,000 Cargo: Varies by weight
Rhode Island	80,000 lbs.	No tolerance	26¢	26¢	For-hire Carriers Property Damage: \$25,000 Public Liability: \$250,000/500,000 Cargo: \$25,000 Lessor of Trucks Property Damage: \$10,000 Public Liability: \$25,000/50,000
Vermont	80,000 lbs.	10%	15¢	16¢	\$20,000/40,000/10,000

Table 2.10 New England Truck Regulations (continued)

	Temporary Trip Permit	Weight Permits
Connecticut	None in lieu of registration	<ul style="list-style-type: none"> • Unlimited access for carriers 102" wide • Twin combinations restricted to one mile access or by permission
Maine	None in lieu of registration	<ul style="list-style-type: none"> • One mile access for twin combinations • 53' semitrailer permits • Special commodity permits • General commodity permits
Massachusetts	Single trip permit: \$5.00	<ul style="list-style-type: none"> • Single trip permits • Annual permits • Special turnpike permits • Annual trailer length permits
New Hampshire	One round trip permit: \$5.00	NA
Rhode Island	None in lieu of registration	NA
Vermont	IRP trip permit or temporary registration	<ul style="list-style-type: none"> • Unlimited access for 102" wide carriers • One mile access for combinations • Company and route-specific permits

Figures

Figure 2.1 National Highway System (NHS) Network



**Figure 2.2A Volume/Capacity for Rhode Island
National Highway System**

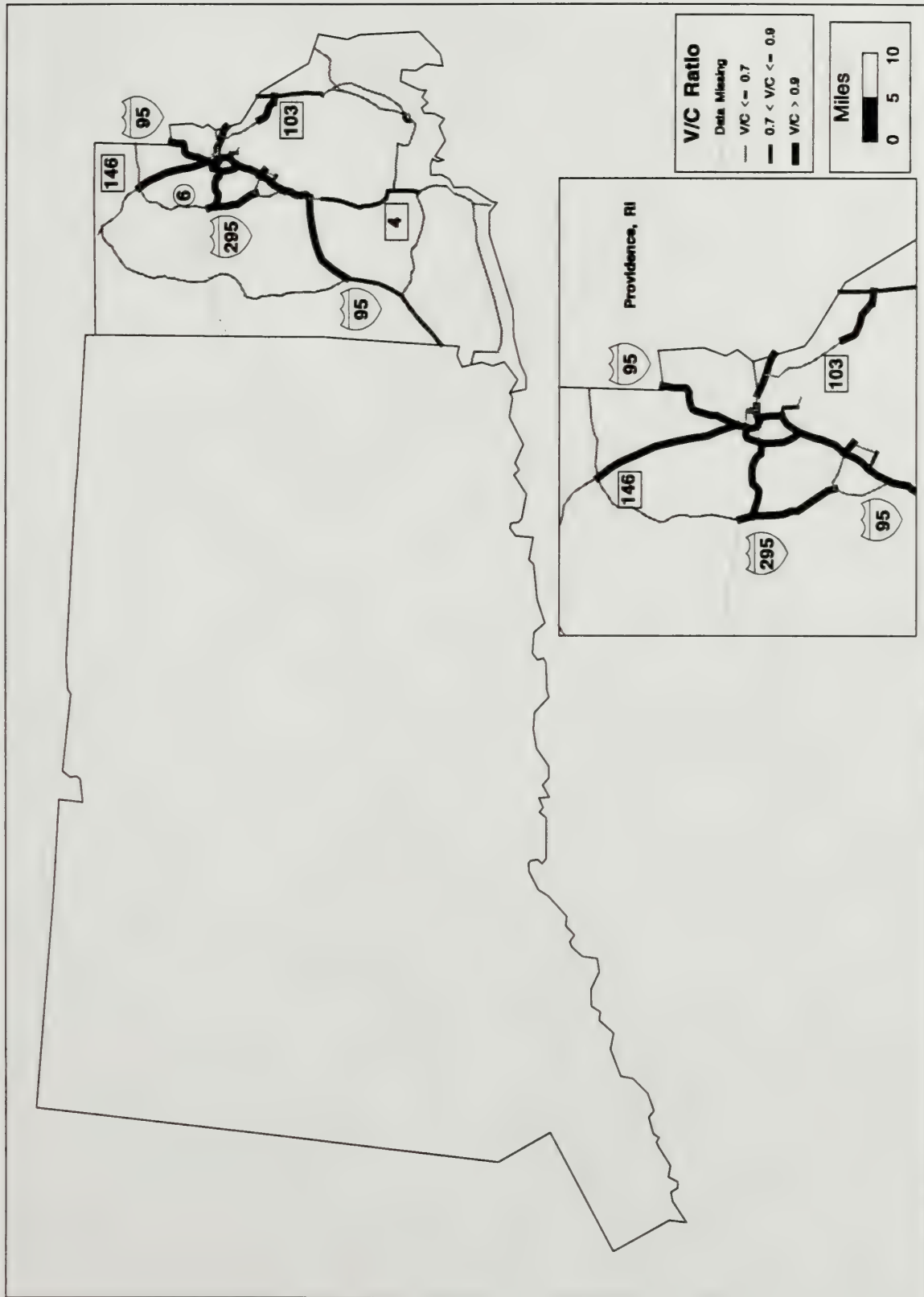
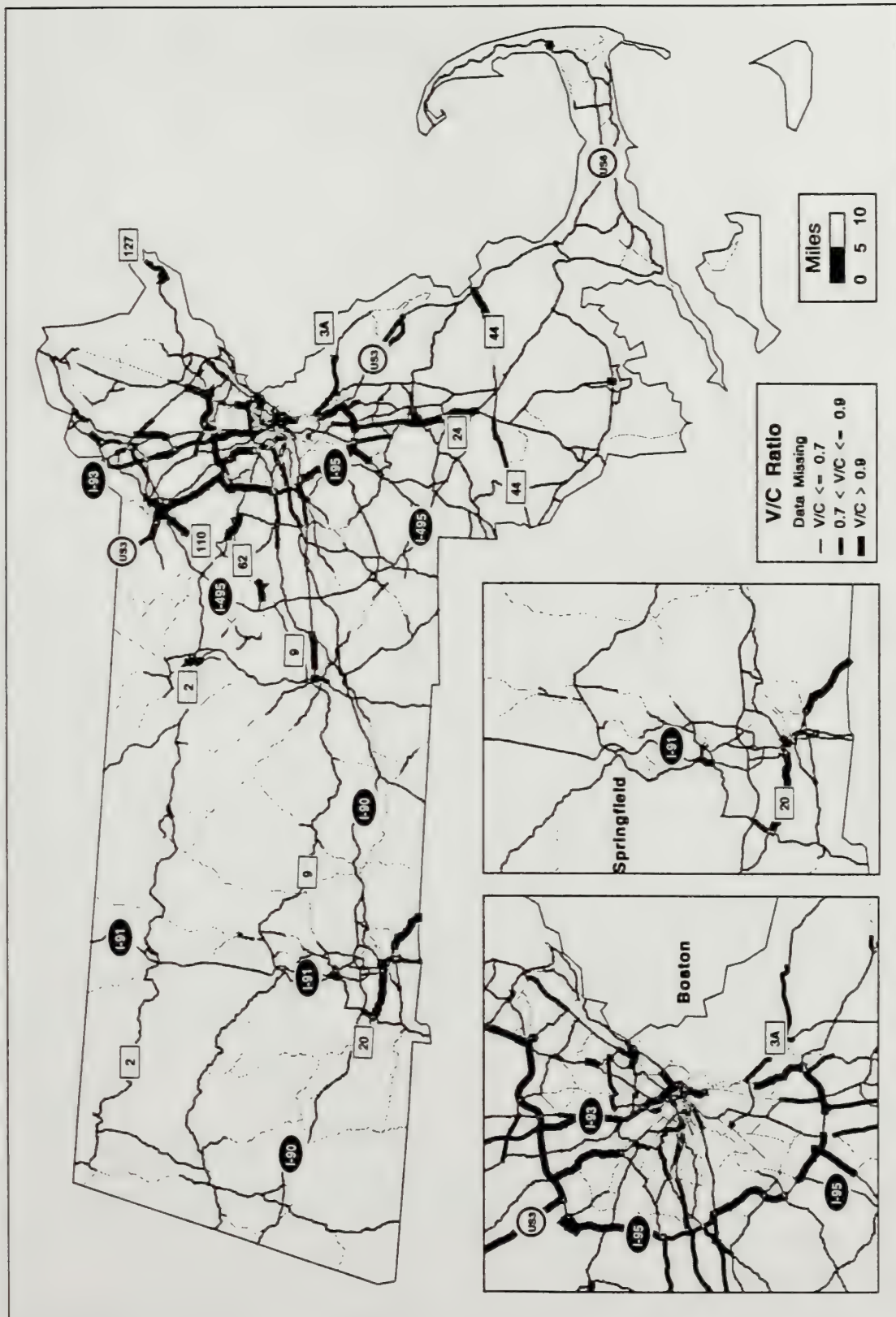


Figure 2.2B Volume/Capacity for Massachusetts
Principal Arterials



**Figure 2.2C Volume/Capacity for New Hampshire and Vermont
National Highway System**

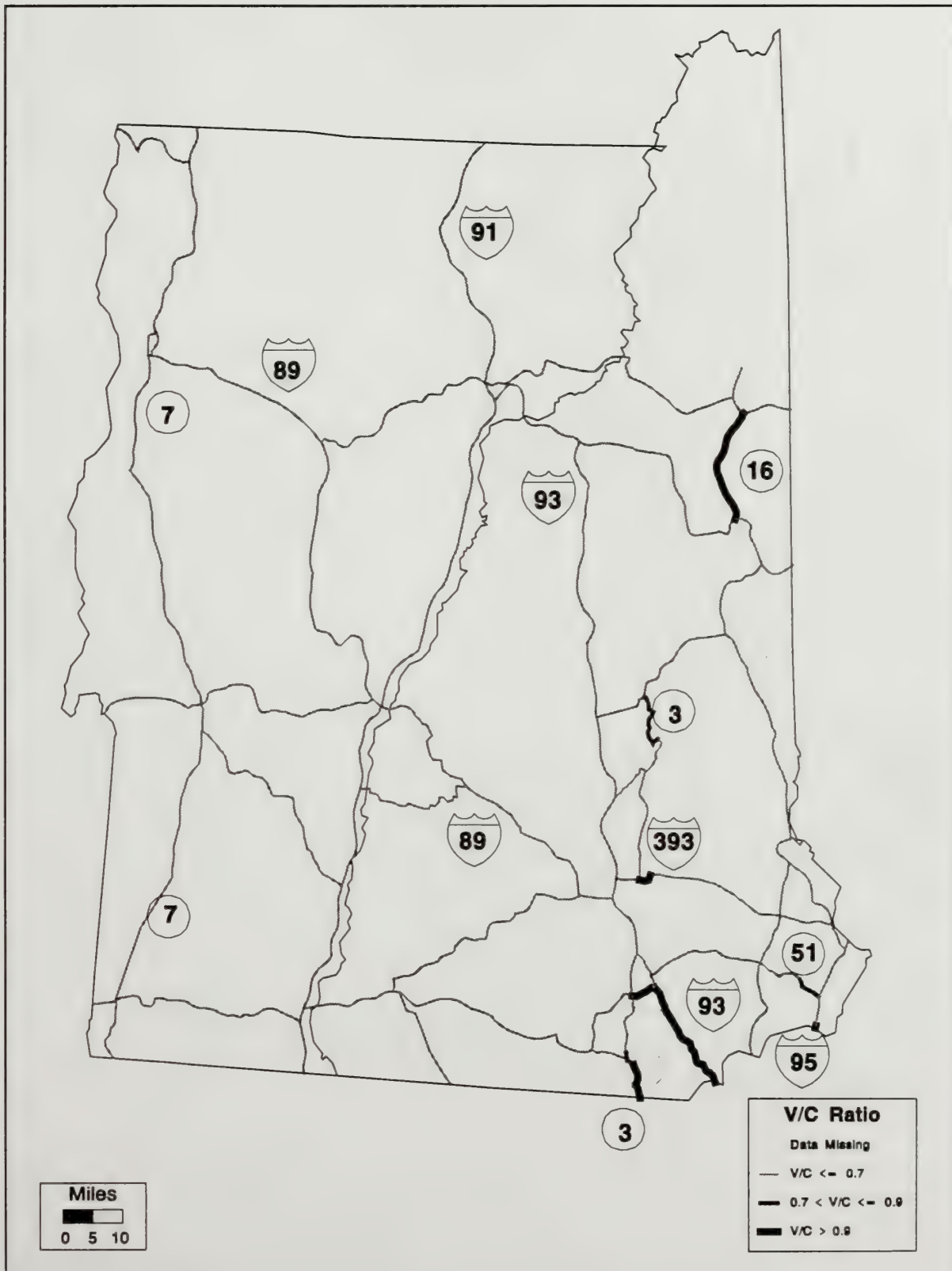


Figure 2.3A Bus Routes – Northern New England

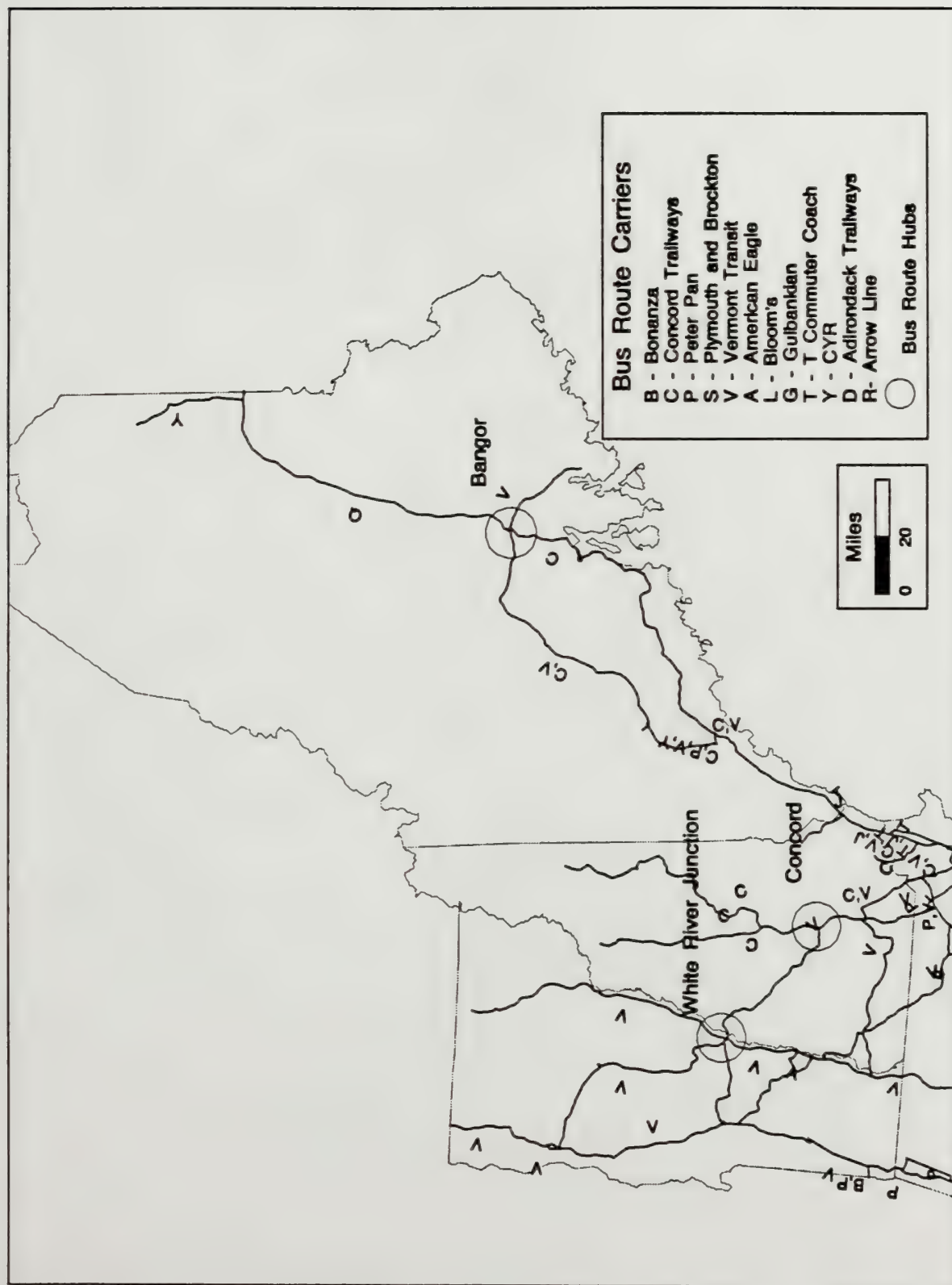
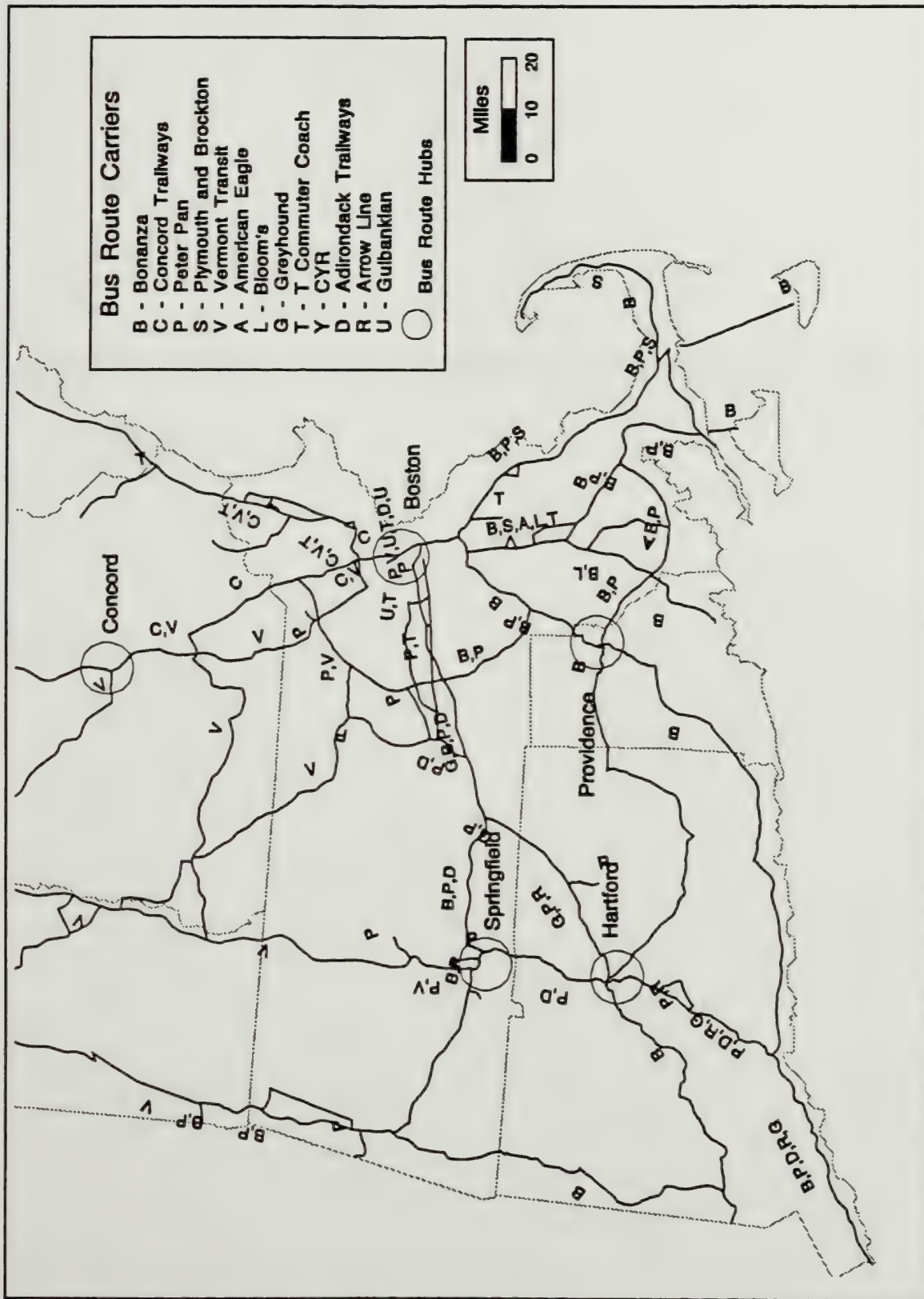


Figure 2.3B Bus Routes – Southern New England



3.0 *Railroads*

Chapter 3.0 – Railroads

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3.0 Railroads

■ 3.1 Key Issues/Focus

The inventory phase has been intended to serve as a data gathering and compilation process with a focus on regional situations and issues. With few exceptions, this process has been conducted on a state-by-state basis since that is where most of the readily available data reside.

In terms of intercity passenger operations, the southern half of New England is well served by Amtrak's Northeast Corridor and its offshoots. Future developments including the inauguration of high speed rail service will further strengthen Amtrak's position in this market. In comparison, the northern tier of states receive much less rail passenger service. However, the states have plans for expanding services beyond the current minimal operations.

Section 403(b) of the Federal Rail Passenger Service Act provides for the extension or expansion of Amtrak's network by a sponsoring organization on a cost-sharing basis. Amtrak policy, based on its current overall financial situation, further defines its ability to enter into 403(b) agreements. Currently, the incremental operating expense could be shared on a 70 percent to 30 percent basis. Amtrak's share of long-term avoidable losses would be no more than 30 percent, up to a maximum annual Amtrak cost of \$1,000,000. Capital costs could also be shared on a 70 percent to 30 percent basis. Again, Amtrak's share would be no more than 30 percent. Rolling stock, however, must be provided by the sponsor unless Amtrak can assign equipment currently on hand if directed by Congress. At this time Amtrak has no spare rolling stock.

In Amtrak's basic authorizing legislation, Congress authorized funds for new 403(b) services. The authorized amounts were \$7.5 million for FY 1993 and \$9.5 million in FY 1994. For FY 1993, however, none of these funds were appropriated.

Commuter rail services are typically the responsibility of the sponsoring state agency and are presently focused on Boston and the New Haven-New York metropolitan corridor. Plans for expansion of commuter rail service south of Providence and east of Old Saybrook, CT will involve institutional issues such as cost sharing, operational agreements, etc. which will require coordination among the sponsoring agencies. Although each state seemingly has a plan or concept in mind, the end product should not result in a set of disjointed commuter operations. Hence the need for a "regional" approach. As is discussed in the Amtrak existing conditions overview (Section 3.3.1), the Northeast Corridor (Shoreline) route in New England already has three separate owners plus other users with differing concerns and priorities.

Given Amtrak's focus on the high speed intercity market, what may ultimately evolve in the southern tier of states is a set of connecting local services from Boston to New Haven. One spin-off from the Amtrak New Haven-Boston electrification project is the possible use of electrified equipment for these local services along the Shoreline. In southwestern Connecticut, shifting employment and population patterns away from New York City may further increase an already discernible trend of "reverse direction" commuting traffic on the Metro North New Haven Line.

The focus of freight service is on intermodal operations and the movement of bulk commodities. Bulk commodities in New England typically include forestry products (paper, lumber, wood chips), plastics, chemicals, aggregates and waste materials. The most visible "growth market" in terms of regional and national significance is intermodal, which is understood to represent the movement of merchandise in containers or trailers on purpose-built railroad equipment.

Contemporary trailer-on-flatcar (TOFC) or "piggyback" operations can be dated to 1935 when the Chicago Great Western began to shuttle common carrier truck trailers between Chicago and Dubuque on flatcars. Marine containers began appearing on flatcars (COFC) in the 1960s. It was soon found that in-transit time could be saved by running containers coast-to-coast by railroad, rather than by ship through the Panama Canal. Thus the "land bridge" concept was born. This was an intermodal movement whereby containers were transferred from a ship to a train on one coast and were then transported across the country and placed aboard a waiting vessel. The "land bridge" trend has been given further impetus by the recent construction of container ships whose beam size (width) exceeds the dimensions permitted by the Panama Canal. A variation of the "land bridge" is the "micro bridge" whereby a container is transferred from a ship and then is moved by rail (and possibly truck) to its final domestic destination.

The development of intermodal freight operations was significantly assisted by the 1980 Staggers Rail Act, which freed TOFC and COFC traffic from Interstate Commerce Commission (ICC) rate restrictions. This action allowed railroads to price TOFC and COFC shipments more competitively against long-haul trucks. In a broader scope, the Staggers Rail Act has allowed railroads to raise any freight rate that falls below 180 percent of out-of-pocket costs and to enter into contracts with shippers to set price and service, both without ICC approval.

The shipment of containers on railroad lines has rapidly evolved to a double stack operation (two levels of containers per car) and is more than just a technical concept. It has had major service implications for the railroad, trucking and third party distribution industries. In some cases, shippers own the rolling stock and containers, and handle all of the distribution contracts; the railroad simply provides a line-haul transportation service. Specially designed double stack cars carry two levels of containers, with one container secured on top of the other. Early containers (Phase I) were eight feet six inches high. Recent containers (Phase II) are nine feet six inches high and future containers will be taller. While the bottom container is carried about a foot above the rail, the upper container can reach heights of 20 feet or more above the rail. Hence there is a continuing concern for providing sufficient vertical (overhead) clearances in order to operate double stack trains. The operation of tri-level automobile carriers poses similar clearance concerns. Owing to

their age and constraints imposed by terrain, Eastern railroads and particularly those in New England typically do not enjoy the same generous clearances that are afforded to Western railroads. Thus, the provision of adequate clearances for present and future intermodal operations is a paramount issue in order for New England to maintain and expand its access to the national double stack network.

■ 3.2 Methodology

The prime objective of the inventory phase was to assemble data on each state's current rail system and operations, applicable legislation and regulation, and current and future actions being taken by the state. This information was primarily obtained by contact with the respective state Departments of Transportation. The project team also contacted representatives of the railroads serving the region and other interested parties for information concerning the status of New England's railroads and associated intermodal facilities. An extensive literature review was also conducted.

It should be remembered that the inventory was assembled to support a regional strategy development process. Therefore, the inventory does not attempt to document every freight siding, passenger stop, and abandoned right-of-way. Such an assemblage of data would have exceeded the time and budget constraints of the Project and would have distracted the Project from its regional objectives. This is not to suggest, however, that the inventory phase has presupposed a "core" regional rail system for New England. To the contrary, all of the freight and passenger service operators identified in the state rail plans are included in the data base. This encompasses all of the so-called freight railroad "short lines" operating in the region. Since the national trend of establishing short lines is also occurring in New England, and because short line railroads play an important role in the provision of rail service by providing services that otherwise would have been abandoned, this category has some significance within a regional context.

Data pertaining to railroad lines, ownership, operating agreements and type of service (freight, commuter, intercity, etc.) were assembled on a segment-by-segment basis. These were then used to update the GIS-based railroad and highway network mapping (FHWA and FRA Oak Ridge Model) which will be used for the project. The rail segment data were obtained primarily from the state rail plans with updated information being added based on the Project Team's working knowledge of the rail system and consultation with selected railroad operators.

Data concerning the condition of track structure, bridges, signal systems, etc. (so-called hard engineering data) varies among the state rail plans in terms of comprehensiveness and current status. Since the present scope of this project does not allow for a complete condition assessment inspection of the rail lines, the state data will have to suffice. As key routes and facilities emerge during the course of the study, a more detailed examination of selected line segments may be warranted.

Detailed data concerning the type and volume of goods shipped have proven somewhat elusive. Statistics concerning the number of carloads handled and the types of commodities handled were available from some state rail plans and previously published studies. However, carloadings by route, terminating facility, originating carrier, etc. are typically not reported to the states. Indeed, some states do not receive annual reports on freight traffic from rail carriers within their state. Since participation in the Project is on a voluntary basis, the various operators are within their privilege to release only that information which they deem appropriate. Some supplemental information was obtained from contemporary trade journals and news articles. Data for passenger rail services which are operated in the public realm was readily available and was obtained for the most recently available year.

An exact definition of the term "intermodal," particularly as concerns freight operations, is not easily found. Strictly speaking, of course, intermodalism signifies nothing more than the use of two or more modes for a transportation movement. More recently the term has come to imply freight shipment via an integrated transportation system, often under the control of a single carrier, in a continuous movement from shipper to consignee. In "Webster's Third New International Dictionary" the word "intermodal" is not listed. The 1976 edition of Webster's defines the older companion term "piggyback" as "the process of loading, transportation and unloading of truck trailers on railroad flatcars of special design." It also defines "container" as "a possible metal compartment in which freight is placed for convenience of movement especially on railroad container cars." Thus are the semantics which apply to this portion of the Project.

In order to reach closure as to which key intermodal rail freight facilities should be identified by the Project, the "Official Intermodal Guide – Fall/Winter, 1993 Edition" was consulted. Also used for guidance in this regard was the Massachusetts Institute of Technology Center for Transportation Studies Report ("Martland Study") entitled "Rail Service in New England: Final Report" dated April 1992.

Various feasibility studies, environmental impact analysis, published schedules and services guides were also consulted. A complete listing of references is appended.

■ 3.3 Existing Conditions

In this section, the present-day New England rail system is reviewed, with the purpose of providing an overview of the current state of passenger and freight rail services in New England. Bounded by the Hudson River on the west and by the Atlantic Ocean to the south and east, New England railroads operate within a well-defined, albeit somewhat isolated, region. The present New England rail network is depicted in Figure 3.1.

There are 31 railroads that own or operate railroad lines in New England. Table 3.1 lists each of these railroads, showing the states in which the lines are owned and/or operated. In some cases, the states own the lines or participate in rail operations. Table 3.2 presents a

breakdown of commodities handled. The rail network is rather dense, particularly in the southern half of the region. Despite this network density, each railroad concentrates its operations in certain areas with no major overlapping of routes. Guilford Transportation Industries (GTI) encompasses much of central New England including the State of New Hampshire, eastern Vermont and the southern half of Maine. In Massachusetts, GTI's presence is offset by Conrail's extensive network and western gateway connections.

Other larger carriers operate in more limited areas. The Providence and Worcester (P&W) operates in Connecticut, Rhode Island and central Massachusetts; the Central Vermont (CV) operates in a north-south configuration from Vermont down the Connecticut River valley to Long Island Sound; and the Bangor & Aroostook (BAR) operates exclusively in northern Maine. The Canadian Pacific and Canadian National railroads provide routes out of New England to the Canadian Maritime Provinces, Montreal and points west.

A review of the larger and more regionally important railroads follows. Individual state situations, including shortlines, are presented subsequently.

3.3.1 Amtrak (National Railroad Passenger Corporation)

Created by an act of Congress in 1971, Amtrak assumed responsibility for operation of the U.S. rail passenger system. Amtrak operates intercity passenger service along the southern New England Shoreline route as the northern end of its Washington-New York-Boston Northeast Corridor. This service is augmented between New Haven and Boston by a paralleling Inland Route service which operates via Hartford, Springfield and Worcester. Present schedules provide 10 Northeast Corridor trains in each direction, plus two Boston-Springfield-New Haven roundtrips and four Springfield-New Haven roundtrips daily. Daily service from New York City to Montreal (the "Montrealer") operates over the Shoreline as far east as New London and thence over Central Vermont trackage to the Canadian border. The Inland Route also hosts a daily Boston-Chicago train, the "Lakeshore Limited." Amtrak passenger counts by station in New England for 1992 are given in Table 3.3. Amtrak also operates seasonal service from New York City to Cape Cod (Hyannis) by way of Attleboro and Middleboro.

Amtrak owns the Shoreline right-of-way from New Haven to the Rhode Island-Massachusetts state line. West of New Haven the line is owned by the State of Connecticut with dispatching functions performed by Metro-North. From the Rhode Island state line to Boston South Station, the line is owned by the Massachusetts Bay Transportation Authority (MBTA) but dispatching functions are performed by Amtrak. Amtrak is presently the contract operator for the MBTA's commuter rail system and for the Connecticut Department of Transportation's Shoreline East (New Haven-Old Saybrook) commuter service. Contract operation of commuter services is viewed as an important source of revenue by Amtrak. Amtrak also owns the New Haven-Springfield segment of the Inland Route.

Amtrak does not engage in common carrier freight transportation activity; however freight operators do utilize Amtrak-owned trackage and, given the location of these well-maintained lines, Amtrak plays a role in freight policy considerations. Amtrak does transport a considerable volume of express parcels and U.S. Postal Service mail in specialized Material Handling Cars. These cars are operated in regular passenger trains and the revenue derived therefrom is also important to Amtrak. Both Springfield, MA and Boston South Station are located close to regional bulk mail handling facilities which further strengthens Amtrak's position with respect to dock-to-dock mail delivery times.

3.3.2 Conrail (Consolidated Rail Corporation)

Although operating only in the southern half of New England on approximately 400 route miles, Conrail presently provides gateway access into the national rail network for most of the region. Conrail is an important participant in intermodal operations. Conrail's operations in New England are centered on its Boston & Albany Line (New England Division Mainline) extending from Selkirk, NY to Boston's Beacon Park yard. This line is used for interchanges with six connecting freight railroads in Massachusetts: Guilford Transportation Industries at West Springfield and Barber Station (north of Worcester); Providence and Worcester at Worcester; Central Vermont at Palmer; Housatonic at Pittsfield; Massachusetts Central at Palmer; and Pioneer Valley at Westfield. Three of these locations register among Conrail's top 50 systemwide interchange points. The GTI Interchange at Barber Station involves more than 40,000 loads per year and about 33,000 loads per year are interchanged with the P&W at Worcester. At Palmer, Conrail interchanges more than 9,000 loads per year with the Central Vermont (primarily) and the Massachusetts Central. Major on-line automobile distribution facilities are located at Westboro and Framingham.

Intermodal traffic (trailers and containers) operating in dedicated trains now represent 40 percent of the 6,800 yearly Conrail train movements on the Boston and Albany Line. Conrail refers to these as TV (trail van) trains. There are three TV (intermodal) terminal sites owned by Conrail on the Boston and Albany line: Beacon Park-Boston, Worcester and West Springfield. Worcester is the interchange point for P&W intermodal traffic and is a major loading site for United Parcel Service. West Springfield and Beacon Park handle a variety of intermodal traffic including trailers and containers. Double stack container traffic on the Boston and Albany line currently operates only as far east as Worcester, since restrictive clearances preclude operation into Beacon Park. Double stacked containers destined for Boston are reloaded as single stacks at Conrail's DeWitt Yard in Syracuse, NY. This "filleting" operation is performed in reverse when westbound single stack containers from Boston reach DeWitt.

Conrail also operates an extensive network of secondary lines in Massachusetts, particularly south of Boston. Yards are located at Readville, Mansfield, Braintree and Middleboro. Conrail has moved aggressively to prune its system of unwanted branch lines in Connecticut and Rhode Island. In Connecticut, the Providence and Worcester and the Housatonic have expanded their operations onto former Conrail lines. Conrail's departure from Rhode Island has resulted in the P&W being the only interstate rail operator serving the state.

3.3.3 GTI (Guilford Transportation Industries)

Encompassing over 1,200 route miles with four operating subsidiaries (Boston & Maine, Maine Central, Portland Terminal and Springfield Terminal Railway), GTI constitutes the largest railroad presence in New England. The combination of these formerly separate railroads has provided the opportunity for various operating efficiencies such as pooling of equipment, through service, elimination of interchange points and duplicative facilities.

GTI operates an east-west freight Main Line across northern Massachusetts (via the Hoosac Tunnel) which is parallel to Conrail's Boston & Albany Line. Until recently (1990) Conrail and GTI interchanged traffic at Rotterdam Junction, New York near Albany. However, most GTI interchange and through traffic now moves over Conrail's line between Selkirk and Worcester. From Worcester, GTI trains are routed north to Ayer. CR/GTI through freight trains operate between Selkirk and Nashua, NH and Portland, ME. Traffic includes paper moving out of northern New England and inbound Ford automobiles destined for a distribution facility (Nu Car Carrier) at Ayer. Approximately 30 unit coal trains per year operate on this route from Pennsylvania mines to an electric utility on GTI (Lowell-Concord branch) at Bow, New Hampshire. Until recently, GTI had not been a major intermodal carrier. However, in 1992 the company opened a facility on 35 acres of land in the former Fort Devens military base at Ayer, known as Port Devens. The land is presently leased from the U.S. government. GTI recently began operating a Chicago-Ayer intermodal train into Fort Devens in a joint operation with Canadian Pacific. At this writing, the average inbound load is 15 to 20 containers per train.

Beyond Ayer, GTI's main route heads northeast through Lowell, Dover NH, Portland and Bangor ME with a final connection to the Canadian Pacific at Mattawamkeag. The route connects with the Saint Lawrence and Atlantic at Portland and with the Bangor and Aroostook at Bangor.

3.3.4 CP (Canadian Pacific Rail System)

The importance of this Canadian railroad lies in the connections which it provides to routes which operate west through Canada. CP presently operates a route from Montreal through Quebec City to St. John, New Brunswick. CP received approval in August 1993 from Canada's National Transportation Authority to abandon all lines east of Sherbrooke, Quebec including the route through Maine to St. John. According to trade journal reports, CP is losing \$50,000 a day by operating over these lines. In 1989 CP had instituted a "low cost" subsidiary, Canadian Atlantic Railway, to operate these lines, but they remained a burden. In November 1993 CP announced its intention to shed additional trackage between Montreal and Sherbrooke. A branch line reaches Vermont by heading south from a junction west of Sherbrooke. This branch line connects with GTI at Wells River. CP has filed for abandonment of this route and is seeking to sell it.

CP also has two major operations within the United States; the former 1,500-mile Delaware & Hudson (D&H) in the northeast and the SOO Line, a 5,000-mile railroad operating in the Midwest serving Chicago, Kansas City, Minneapolis and western Canada. The combined

CP, D&H and SOO holdings operate under the title of CP Rail System. Of particular significance for this Project is the recent D&H acquisition which has given CP several major routes into the northeast which are favored over the Vermont route. The "Vermont Rail Feasibility Study" (1993) estimated that the D&H acquisition has served to reduce CP traffic volume through Vermont from 30,000 carloads annually (1984) to 1,600 (1991) with the downward trend expected to continue.

CP and CN are working on plans to unify their services east of Winnipeg, Manitoba, an event with potentially substantial impacts to rail service in New England.

3.3.5 BAR (Bangor and Aroostook Railroad)

The Bangor and Aroostook services the northern half of Maine over approximately 430 miles of track. The railroad's major customers are paper and lumber companies located in the region. The BAR interchanges with the Canadian Pacific at Brownville Junction and with Guilford Transportation at Northern Maine Junction. The railroad serves a rail/water intermodal facility in Searsport. Trailer-on-flat car loading facilities are available at Madawoska, Caribou, Presque Isle, Oakfield, Millinocket and Bangor. Bulk transfer facilities are available at Northern Maine Junction. The BAR was recently sold by the Amoskeag Company of Boston to an investor group, Ironhorse Ventures of New York, for about \$28 million. Press reports state that the BAR had a net profit of \$750,000 (1992) on revenue of roughly \$22 million.

3.3.6 CV (Central Vermont Railway)

The Central Vermont Railway operates a 370-mile regional line extending from Montreal to New London, CT. The line from Montreal enters New England at East Alburgh, VT and thence runs 325 miles south to New London. The railroad operates in four states and has interests and operating rights on portions of the so-called Connecticut River Line that involves Amtrak and GTI. Part of the CV network is traversed by Amtrak's "Montrealer" service that operates between Washington and Montreal. Recently, CV acquired ownership of the segment between Brattleboro and Windsor, VT from Amtrak. Amtrak had exercised condemnation powers to obtain the line from GTI ownership, based on GTI's refusal to maintain the segment in suitable condition for operation of the "Montrealer." This condemnation process has resulted in long-running litigation involving a series of court appeals between Amtrak and GTI.

CV handles a significant amount of interchange traffic with Conrail (at Palmer, MA) and its parent corporation Canadian National (at East Alburgh). According to the "Vermont Rail Feasibility Study," lumber and paper products represent 26 percent of CV's total freight volume. Waste products account for 10 percent of the CV's traffic, the bulk of which is fly ash from AES Thames at Montville, CT. Traffic on the northern end of the line has exhibited a marked decline, with Vermont traffic having declined 42 percent since 1987; most of this traffic loss accrued north of Essex Junction.

Canadian National, which has been faced with the need to restructure its operations, placed the entire CV operation up for sale in October 1993. According to press reports, a management-led employee stock ownership plan has made a bid for the property and Canadian National is soliciting bids from other qualified operators. A decision on sale of the CV is due by the summer of 1994.

3.3.7 P&W (Providence and Worcester Railroad)

The Providence and Worcester is headquartered in Worcester, Massachusetts from where two lines extend south into Providence, RI and Groton, CT. From these points freight service is operated over Amtrak's Shoreline via trackage agreements. The P&W is the only interstate freight railroad serving Rhode Island. The carrier has recently enlarged its operations in Connecticut to include New Haven, Danbury, Derby and Middletown in the wake of Conrail's continuing retrenchment in that state.

The railroad presently operates over 460 miles of track in Massachusetts, Connecticut and Rhode Island of which approximately 170 miles are owned by the P&W. Freight traffic is interchanged with Conrail at Worcester and New Haven, with GTI at Gardner, Massachusetts and with the Central Vermont at New London. The main classification yard, engine facilities and operations center are located at Worcester. Smaller classification yards are located at Cumberland, Rhode Island and Plainfield, Connecticut.

The P&W's regional significance is also due to its involvement with intermodal freight service. The railroad presently operates two intermodal yards in Worcester. In 1987 the P&W, with Intransit Container, Inc. (ICI), established a United States customs bonded container terminal on nine acres of land on Southbridge Street. In 1989 the P&W and ICI established a second double stack container facility off Wiser Avenue. The facilities are marketed by the P&W as the Port of Worcester. P&W container trains are interchanged with Conrail for destination to and from the west. The majority of the traffic handled at the Port of Worcester is comprised of double stack shipments of goods originating in the Far East. Container vessels are docked at Seattle, Tacoma, Long Beach, Oakland and Los Angeles and are operated cross country in double stack trains. Typical rail transit time is five days. P&W's intermodal traffic totaled just under 40,000 containers in 1992, and is presently the largest component of P&W's operating revenues. For 1993, P&W expects to handle 50,000 containers at Worcester.

3.3.8 State and Local Operations

In addition to the regional railroad operations, the inventory process has also compiled data, typically on a state-by-state basis, pertaining to intrastate rail operations and facilities. Some of these services, such as commuter rail operations and certain key shortlines with important terminal activities, are significant in a regional context.

The discussion is not intended to review each branchline and shortline in detail but does attempt to place these operations in the context of the New England regional rail system. It

should be noted that all active rail segments and operators have been identified in the associated GIS mapping prepared for this project.

Connecticut

In addition to the previously discussed Amtrak intercity services, the state oversees the operation of an extensive (132 route miles) commuter rail system, termed the New Haven Line, in association with Metro-North Commuter Railroad. Service originates from Grand Central Terminal and extends as far east as New Haven. Three branches are also served: New Canaan, Danbury and Waterbury. Approximately 250 trains are operated on a weekday schedule. The right-of-way between New Haven and the New York state line is owned by the State of Connecticut. Under the terms of an amended agreement between the Connecticut Department of Transportation and the Metropolitan Transportation Authority of New York, Connecticut funds approximately 60 percent of the line's operating costs and MTA funds the remaining 40 percent. Capital projects within Connecticut are funded by the State of Connecticut. The procurement costs for rolling stock are shared, 63 percent by Connecticut and 37 percent by the MTA.

Shoreline East service between Old Saybrook and New Haven was initiated in May 1990. Connecticut DOT administers and funds the service, and contracts with Amtrak to operate the service. Operations are scheduled to provide convenient connections with bus service in the downtown New Haven Central Business District and with New Haven Line trains. Shoreline East presently is a weekday-only morning and afternoon peak period operation with a daily total of 18 trains carrying a total of approximately 1020 passengers. Ridership for the New Haven Line service is presented in Table 3.4. Hartford, New Haven, Bridgeport, Stamford and New London feature established intermodal (rail, bus, auto) passenger facilities. All are served by local transit bus operations, while Hartford and New London also are served by intercity bus operators including Bonanza and Greyhound.

Freight service within Connecticut has witnessed an expanding role by the Providence and Worcester and Housatonic Railroads in the wake of Conrail's retrenchment. The Housatonic Railroad has re-established local through freight service on the line from Pittsfield, MA to Danbury, CT. The Providence and Worcester accesses the Shoreline route at Groton via its Norwich & Worcester branch. Operations have expanded westward to encompass the New Haven, Waterbury and Danbury areas. The Connecticut Central provides local service within the Middletown area. Conrail freight destined for Hartford and New Haven is routed over Amtrak's New Haven-Springfield Line.

Rhode Island

In addition to Amtrak intercity service, the state is also served by the Massachusetts Bay Transportation Authority's (MBTA's) Attleboro commuter rail line. Five peak period round trips per day are operated out of Providence under the terms of a seven year (1988-1995) operating agreement between the State of Rhode Island and the MBTA. Daily ridership is approximately 400 passengers. The operating agreement, dubbed the "Pilgrim Partnership," is somewhat unique in that the State of Rhode Island purchased two trainsets with capital funds and then conveyed the equipment to the MBTA to cover the State of Rhode Island's share of the operational costs.

Providence does not contain an all-inclusive intermodal passenger facility. However, intercity and transit bus service is accessible via bus connections from the railroad station, which is attached to a parking garage.

The Providence and Worcester Railroad provides the only interstate railroad freight service in Rhode Island. The P&W owns approximately 120 miles of trackage within Rhode Island and additionally claims permanent and perpetual freight service easements over the Amtrak Shoreline within Rhode Island.

In July 1989, the P&W lost a bid to continue a five-year tax refund schedule that had been in effect since 1985 in the State of Rhode Island. Under this law, P&W was exempted from local property tax and state gross earnings tax liabilities. In return for this consideration, Providence and Worcester had agreed not to abandon unprofitable or marginally profitable rail lines. Consequently, in January 1990 P&W petitioned the ICC for permission to abandon approximately 20 miles of branch lines in Rhode Island which it deemed unprofitable. P&W estimated that closure of these lines would reduce its operated rail-miles in Rhode Island by nearly 20 percent to less than 100 miles.

Providence and Worcester's Rhode Island operations are focused on the Providence-East Providence area, with its scheduled service extending on the Northeast Corridor line as far south as West Davisville where freight is interchanged with the Seaview Transportation Company. Seaview operates a non-common carrier switching service over extensive trackage in the Quonset Point/Davisville Industrial Park. Development of this former military facility is a key priority of its owner, the Rhode Island Port Authority. One of the major assets of the Quonset Point/Davisville Industrial Park is that it is served by air, deep water, highway and rail modes. Among the present tenants is North Atlantic Distribution, Inc. which handles the shipment (by truck) of approximately 30,000 imported cars per year for several auto makers through the facility to points throughout the northeast.

The Providence and Worcester also serves the Port of Providence via the Harbor Junction Wharf Industrial Track. Much of the trackage is in public streets. Industries served consist primarily of petroleum and scrap metal concerns. On the opposite side of the Providence River, in East Providence, the P&W has been involved in a long-term project to develop the so-called "South Quay" – a 35-acre rail/ship terminal. Although the project has been slowed by environmental and funding considerations, dredging has been completed, and the P&W reportedly is seeking participation of a partner in completing the construction of dock, warehouse and container handling facilities.

Another rail segment of note is the Newport Secondary track extending from downtown Newport to the Massachusetts state line at Fall River. A tourist/dinner train currently operates on an abbreviated section of the line. However, connections to lines in southeastern Massachusetts are presently severed due to the damaged and out-of-service Sakonnet River Drawbridge. This line is noteworthy because it represents the only rail line serving Newport and its linkage to the New England rail system is entirely dependent on the reactivation of out-of-service connecting trackage in the neighboring state of Massachusetts.

Massachusetts

Massachusetts, specifically Boston South Station, is the northern terminus for Amtrak's Northeast Corridor services, the companion Inland Route and the long-distance "Lake Shore Limited." Amtrak also serves as the operator of the Massachusetts Bay Transportation Authority's commuter rail system consisting of 11 lines operating out of South Station and North Station on a total of 244 route miles. The commuter rail system has been the subject of substantial capital outlays for rehabilitation and expansion over the last decade and ridership has grown accordingly. From 1988 to 1993 ridership grew by 32 percent to an annual figure of approximately 21.6 million passengers. Daily passenger counts by station are shown in Figure 3.2. Further ridership growth is likely as new extensions are completed and as additional parking spaces are developed at existing stations.

The MBTA also has responsibility for the operation of an extensive rapid transit and bus system serving Boston and surrounding communities. The rail transit system encompasses 77 route miles. Planning studies in the late 1960s and early 1970s envisioned a major expansion of rapid transit service to suburban areas over railroad rights-of-way (e.g. Needham, Reading) but such proposals were subsequently eschewed in favor of rehabilitation of the commuter rail system. Most of the commuter rail route trackage is owned by the MBTA, including the Northeast Corridor route between the Rhode Island state line and South Station. The transit system functions as a major distributor for passengers at Back Bay, South Station and North Station. Interim facilities for intercity bus operators are provided at Back Bay (Bonanza) and South Station (Greyhound and other carriers); permanent facilities are now under construction at South Station.

The state has also invested in upgrading rail lines leading to and located on Cape Cod in order to maintain freight service and develop seasonal rail passenger service. Amtrak continues to operate a seasonal summer weekend service from New York to Hyannis and a tourist/dinner train operation also operates on Cape Cod.

Massachusetts is currently served by ten operating freight railroad companies. Five of these companies have operations confined to the state but each interchanges traffic with interstate railroads. Freight service is provided on approximately 1,200 miles of railroad route-miles within Massachusetts.

The most heavily used rail route serving the state is Conrail's Boston & Albany Line (New England Division) which was discussed previously. The line is owned by Conrail as far east as Framingham where ownership changes to the MBTA. The easternmost 10 miles of B&A right-of-way (from Riverside to Boston) is owned by the Massachusetts Turnpike Authority. Conrail traffic to southeastern Massachusetts destinations is routed south from Framingham via Walpole to the Northeast Corridor at Mansfield and Readville. Traffic destined for Cape Cod is interchanged with the Bay Colony Railroad at Middleboro.

Operations of the Central Vermont and the Providence and Worcester were discussed previously. The Central Vermont main line runs through Massachusetts from the Connecticut state line at Monson to the Vermont line at East Northfield, a distance of 55

miles. The Providence and Worcester is presently a key player in intermodal operations with its major facilities in Worcester.

GTI's operations were discussed previously. The long-term viability of the railroad's former Boston & Maine Fitchburg Division mainline from Boston to Mechanicville, NY apparently depends on improvements to restrictive clearances, including the Hoosac Tunnel.

The Bay Colony Railroad provides freight service on six disconnected routes in southeastern Massachusetts totaling 127 miles. Cape Cod Scenic Railroad, a subsidiary of Bay Colony, operates seasonal service between Buzzards Bay and Hyannis on Cape Cod. The operating company was created by a special act of the Massachusetts Legislature in 1977 to lease lines which were being abandoned by Conrail. One of the major commodities carried by Bay Colony is trash, moving from a truck-to-rail transfer facility on Cape Cod to a power plant at Rochester.

The Massachusetts Central Railroad operates service from connections with Conrail and Central Vermont at Palmer to South Barre, a distance of 26 miles. The company operates a U.S. Customs bonded container handling facility at Palmer; container traffic is the company's principal activity.

Maine

A total of eight railroad companies currently operate within the state. The two largest are Guilford Transportation Industries and the Bangor and Aroostook. GTI operates 380 miles of track in Maine via its subsidiaries Maine Central, Boston & Maine and Springfield Terminal. The Maine Central portion of GTI now includes main line track running from Mattawamkeag to Waterville and Waterville to Portland via Auburn. The Boston & Maine route presently consists of 43 miles of track between Portland and the New Hampshire border. This line provides Maine with connecting service for traffic to southern and western points via connections with Conrail in Massachusetts and the Delaware and Hudson (Canadian Pacific) in New York.

The Aroostook Valley is a terminal railroad operating entirely within the City of Presque Isle and interchanges with the previously discussed Bangor and Aroostook Railroad. The Belfast and Moosehead Lake Railroad operates entirely within Waldo County between a terminus at Burnham Junction and the City of Belfast. The closing of a poultry processing plant at Penobscot has severely impacted the railroad's freight revenues. In recent years the BML has introduced and expanded a summer and fall tourist excursion operation.

The Saint Lawrence and Atlantic Railroad (SLR) operates the former Grand Trunk Eastern Line from Portland, Maine through Lewiston, South Paris and Gilead across New Hampshire into northern Vermont. The railroad is involved in the ongoing development of intermodal facilities in Auburn, Maine.

Two branch lines, the Calais Branch (Brewer to Calais) and the Rockland Branch (Brunswick to Rockland) were purchased by the Maine Department of Transportation in 1987 from GTI. At that time, Maine DOT also executed an agreement with GTI whereby

the state retained the right of first refusal to purchase any railroad rights-of-way which GTI offers for sale in the future. In November 1992, Maine voters rejected a bond issue that would have funded state purchase of the Dover-Foxcroft Branch and the entire Belfast and Moosehead Lake Railroad.

New Hampshire

The state's Rail Plan presents the rail network as being divided into three subsystems: northern, southern and those branches which are owned by the state.

Southern Subsystem

The Southern Subsystem is largely composed of four major lines, two belonging to the Boston & Maine Corporation, a subsidiary of Guilford Transportation Industries, the third belonging to the Central Vermont Railway and the fourth belonging to New Hampshire Northcoast Corporation. The first Boston & Maine line is the Main Line-West which passes through the southeastern part of the state on its way from Boston to Portland. The second Boston & Maine line is the New Hampshire Main Line. It originates in Boston and runs through Lowell, Nashua, Manchester and terminates in Concord. The section between Manchester and Concord is operated by New England Southern Railroad under an agreement with the Boston & Maine. Central Vermont's Connecticut River line follows the New Hampshire/Vermont border from Massachusetts to White River Junction, Vermont. The fourth major line is the New Hampshire Northcoast's Ossipee Branch Line. This line runs from Dover to Ossipee and connects with Boston & Maine (GTI) in Rochester. The Northern Railroad runs from Concord to White River Jct., VT. It is abandoned except for approximately three miles on each end. A few remaining active branch lines in the Southern Subsystem make up the balance of the rail network.

Northern Subsystem

The Northern Subsystem is composed of less rail mileage. There are two main lines crossing the state in an east to west orientation and two branch lines, one to Berlin and the other to Groveton. One of the east-to-west main lines, the Canadian National's former Grand Trunk Eastern has been sold and is now operated by the St. Lawrence and Atlantic Railroad, a subsidiary of Emons Holding, Inc. The line runs from Portland, Maine to Vermont where it connects with the Canadian National Railway at Island Pond. The other east-to-west main line, the Mountain Division, is owned by the Maine Central Railroad, a subsidiary of Guilford Transportation Industries, and runs from Portland, Maine to St. Johnsbury, Vermont. This line is now abandoned except for a section from Whitefield to St. Johnsbury, Vermont which is leased to Twin State Railroad. The two branch lines, the Berlin and Groveton Branches, are owned by the New Hampshire and Vermont Railroad. The Berlin Branch runs from the Vermont border to Berlin. The Groveton Branch splits from the Berlin Branch at Waumbeck Junction in Jefferson and runs to Groveton.

State-Owned Subsystem

The state-owned subsystem is composed of three lines. The first line, the Concord to Lincoln railroad line, located in central New Hampshire, was acquired by the State of New Hampshire from the Boston and Maine Corporation in 1975. It is operated by the New England Southern Railroad and extends approximately 72 miles from Concord to Lincoln.

It also includes the inactive Franklin-Tilton Branch, (2.39 miles) and the inactive Lakeport Spur, (1.05 miles). Interchange is at the Concord Yard with the New England Southern Railroad.

The second line, the North Stratford to Beecher Falls railroad line, located in the northernmost part of the state, was acquired by the State of New Hampshire from the Maine Central Railroad in 1977. It extends approximately 22.5 miles from North Stratford, to Beecher Falls, Vermont at the Canadian border. There is a small switching yard at Beecher Falls and an interchange track at North Stratford that is jointly owned with the St. Lawrence and Atlantic Railroad. The northern 13 miles are inactive; the southerly nine miles are now in operation.

The third line, the Wilton to Bennington Section of the Hillsboro Branch is located in the southern part of the state. It was acquired by the State of New Hampshire from the Boston & Maine Corporation (GTI) in 1988. The line extends approximately 18.6 miles from Wilton to Bennington.

Vermont

Vermont is presently served by a daily round trip Amtrak service, the "Montrealer," which operates on Central Vermont trackage in a northbound-southbound operation, connecting with the Northeast Corridor at New London. The state views the train as an important part of its transportation system. In 1991 more than 60,000 passengers used this Amtrak service in Vermont.

Vermont currently has nine active freight railroads. Five of these constitute the core of Vermont's freight network: Central Vermont Railway, Green Mountain Railroad Corporation, Vermont Railway, Clarendon & Pittsford, and the Washington County Railroad.

The other four Vermont railroads carry significantly less volume and are not part of the core system. The Saint Lawrence and Atlantic operates exclusively as a bridge carrier. Canadian Pacific has all but eliminated its routing of through traffic into Vermont. Springfield Terminal (GTI) operates mostly over Central Vermont trackage in Vermont with light traffic on its own trackage between White River Junction and Wells River. The Central Vermont Railway and Canadian Pacific system have been discussed previously. The major route for traffic terminating and originating in Vermont is via the Vermont Railway and associated Clarendon and Pittsford (CLP) between Burlington and Whitehall, New York.

The Vermont Railway (VTR) operates over a 125-mile line leased from the State of Vermont between a connection with Boston & Maine (GTI) at White Creek, New York and a connection with the Central Vermont Railway at Burlington. At Rutland, the VTR connects with its affiliate, the Clarendon and Pittsford, which provides a route to the Delaware and Hudson via Whitehall. A connection to the Green Mountain Railroad Corporation (GMRC) is also provided at Rutland. Intermodal facilities are located at Burlington and Rutland. In late 1992, the Boston & Maine (GTI) gateway was embargoed due to poor track conditions on the B&M White Creek Branch. About 90 percent of the VTR's traffic moves on the

northern segment between Rutland and Burlington. In 1991, the railroad delivered about 100 trailers on flatcars and originated less than 50.

The Green Mountain Railroad operates between Rutland and Bellows Falls where it connects with the Central Vermont. For the past two years it has been participating with the CV in moving waste ash from Montville, Connecticut to a West Virginia mine served by CSX. This has essentially doubled GMRC's business base (about 2,500 carloads annually). Talc being shipped by Luzenac America accounts for approximately 50 percent of the railroad's traffic. The GMRC also extends into New Hampshire on a one-mile segment leading to its North Walpole Yard.

The St. Lawrence and Atlantic Railroad Company (SLR) operates a 165-mile line from Portland, Maine, to Island Pond, Vermont, where it connects with CN's line to Montreal. SLR has no Vermont business on its 36-mile route from North Stratford through Island Pond. But SLR moved about 13,400 carloads through the state in 1991, mostly southbound, which makes this line comparable in length, volume and type of traffic to the CLP route to New York. When SLR acquired this line from CN in 1988 there was a sharp drop in volume, down 63 percent in one year. However, this route's business is cyclical in nature, relying primarily on Maine's paper industry. More than two thirds of SLR's traffic is pulp and chemicals for that trade.

Twin State Railroad Company (TSR) operates a 28-mile line between St. Johnsbury and Whitefield, New Hampshire, serving a paper plant at Gilman. This is the last active segment of the former Maine Central Mountain Division route from Portland to St. Johnsbury.

Washington County Railroad Corporation (WACR) is a switching railroad that connects with the CV (the originating and terminating carrier) at Montpelier Junction. In 1991 WACR handled 46 cars inbound and 60 cars outbound. Business has typically been at this low level over the past decade, except in 1986 and 1987 when more than 1,000 cars were handled by WACR. The railroad's major customer is Bombardier, a major rail car manufacturer, in Barre, Vermont. WACR transports completed rail cars from the Bombardier plant to Montpelier Junction for shipment to their destination.

Excursion and foliage trains are presently operated by VTR, GMRR, and LVRR.

3.3.9 Military Routes

In 1976, the Department of Defense initiated a Railroads for National Defense Program which included the identification of a Strategic Rail Corridor Network (STRACNET) within the United States. This network was developed from analyses of mobilization/deployment needs, peacetime traffic, and combat tank movements as an indicator of oversize/overweight movements. A clearance profile was developed by the Department of Defense to analyze rail line clearances and validate clearances of lines designated for the national network. The most recent update of this network was published in October 1990. Given the ongoing program of military base closings, the extent of STRACNET will likely

be reduced. Those lines which are included as part of the 1990 STRACNET system in New England are listed below. These routes merit consideration in this Project, since they typically represent key freight routes. Obviously, this identification is subject to future modification during the Project.

- **Connecticut:** Providence and Worcester from Groton Submarine base to the Northeast Corridor then east to Rhode Island.
- **Rhode Island:** The entire length of the Northeast Corridor plus the branch to Quonset Point/Davisville.
- **Massachusetts:** The Northeast Corridor from Rhode Island to Mansfield; then from Mansfield via Framingham to the New York border on Conrail. The Central Vermont line from Palmer to Montague, then east on the GTI mainline via Lowell to Boston and Haverhill.
- **New Hampshire:** From Haverhill to the Maine border on GTI including the branch to Portsmouth.
- **Maine:** From the New Hampshire border to Bangor via Portland and Waterville on GTI.
- **Vermont:** (none).

■ 3.4 Planned Facilities

With one exception, this section consists of planned railroad and associated intermodal projects presented on a state-by-state basis. This is necessitated by the fact that planning and funding strategies have been the responsibility of each state. As will be noted, some of the projects overlap state boundaries and have regional implications.

3.4.1 Amtrak

The extension of electrified intercity rail operations, which presently end at New Haven, to Boston along the Shoreline route is intended to permit true high speed rail service in the northern portion of the Northeast Corridor. Combined with various track, bridge and station improvements, the project is expected to yield trip times of approximately three hours or less for express trains operating between Boston and New York. Completion is scheduled for 1997.

One of the most significant effects of the electrification project and other improvements in the Northeast Corridor is the forecasted growth in intercity rail ridership, from 1.9 million

riders in the no-action alternative to over 3.6 million annual riders with the electrification project. This growth in ridership would result primarily from the following projected changes for modal choices of Northeast Corridor travelers (versus the no-action alternative) in 2010 as presented in the project's Draft Environmental Impact Statement/Report:

	Change in Ridership	% Change
Automobile	-324,000	-2.0
Air	-1,430,000	-37.8
Intercity Rail	+1,756,000	+93.9

In addition to its obvious passenger benefits, the project poses challenges to commuter and freight operations on the Corridor in terms of available operating times, and with respect to reduced clearances for freight movements due to the catenary installation. In recognition of such concerns, the Amtrak Authorization Development Act of 1992 established the need for a Master Plan for the Northeast Corridor to be prepared by the Federal Railroad Administration by the Fall of 1993.

3.4.2 Connecticut

Hartford Commuter Rail

The state is exploring the feasibility of providing commuter rail service to Hartford on the New Haven-Springfield line. The New Haven-Springfield line is owned by Amtrak. The inauguration of commuter rail service in this corridor may be somewhat complicated by the fact that Amtrak has converted the line from double track to single track operation. Commuter rail service could require the re-installation of double track on portions of the line. The provision of commuter rail service over this route would likely be accompanied by a reduction in Amtrak service on this segment, since most of Amtrak's ridership on the line is local, not intercity.

Shore Line East Extension

Extension of Shore Line East service to New London, Mystic or Westerly Rhode Island is under consideration. A service which would enable connections for the Foxwoods Casino at Ledyard may also be viable.

Griffin Line Light Rail Transitway

An Alternatives Analysis is now being conducted to evaluate a proposed light rail line which would operate over an abandoned railroad right-of-way (the Griffin Line) between Hartford and Windsor Locks. Lead responsibility for the Griffin Corridor Project resides with the Greater Hartford Transit District. The initial scope of the project focuses on a 9.5-mile segment connecting downtown Hartford and the Griffin Office Park in Bloomfield and Windsor. The project is ultimately planned to connect to Bradley International Airport.

RoadRailer Service

The Connecticut Public Transportation Commission has recommended the development of a "low profile" freight service in Connecticut. This would consist of single containers on flatcars or a "RoadRailer" type of service. The latter technology entails a special truck trailer that is fitted onto rail wheel sets and combined with other units to build a train with truck bodies carrying in-train forces. Amtrak has conducted tests with RoadRailers and is considering their use in mail transport service. Conrail and Norfolk Southern Corporation presently operate RoadRailer trains (Triple Crown Service) as far north as New Jersey. As opposed to double stack containers, this technology would not run afoul of various restrictive clearances, including overhead electrification on the Northeast Corridor. This equipment would also be capable of operating between New Jersey, New York and Connecticut irrespective of the restrictive clearances imposed by the Hudson and East River tunnels. Initial RoadRailer discussions have been held involving the Providence and Worcester Railroad, Connecticut DOT and TJX Corporation. The P&W views this as a "live" project.

Danbury Branch Extension

The Commission has also endorsed a 14-mile extension of commuter rail service on the Danbury Branch to New Milford. This is viewed as alleviating congestion on Route 7 in Brookfield, New Milford, Danbury and Norwalk.

3.4.3 Rhode Island

Third Freight Track

The state is presently conducting an environmental impact analysis for the construction of a third track between Davisville and Providence along the Northeast Corridor right-of-way. The third track would be used for freight movements by the Providence and Worcester Railroad due to concerns that Amtrak's soon-to-be installed electrification system will not provide sufficient clearance for freight including double stack containers. A second concern is the limitation on freight operating times ("windows") when high speed Amtrak service is operating. In 1991, 40 percent of the P&W's total carloads and 24 percent of its total operating revenues were generated from service provided via the Northeast Corridor; hence, P&W's concern on this issue. The State of Rhode Island also is supportive of the third track issue because it views improved rail access to the Quonset Point/Davisville complex as a key factor in the development of the port facility. The Draft Environmental Impact Statement/Report for Amtrak's New Haven-Boston electrification project estimated an annual revenue loss of \$900,000 to the P&W if freight access were to be permanently restricted, which could cause the P&W to cease freight operations on the corridor.

Commuter Rail Service – North

The state is continuing to examine options for increasing commuter rail service between Providence and Boston. Initial discussions are ongoing with the MBTA relative to renewal of the existing service contract. Off-peak bus connections between Attleboro-terminating trains and Providence could make the Providence service more attractive. Likely providers

of such a service would be the Greater Attleboro-Taunton Regional Transit Authority or the Rhode Island Public Transit Authority. Preliminary planning is also underway for a new MBTA train storage ("layover") facility in Pawtucket at the north end of the Northup Avenue rail yards.

Commuter Rail Service – South

The state has expressed an interest in providing commuter rail service south of Providence, possibly extending to Westerly and a link-up with Connecticut's Shore Line East service. A station stop at Hillsgrove, serving T.F. Green State Airport, has been proposed. Kingston Station is currently being renovated and may also service as a commuter rail station stop.

3.4.4 Massachusetts

Commuter Rail Expansion

A series of MBTA commuter rail expansion projects are in various stages of planning and construction. Construction has begun on the Old Colony Railroad Rehabilitation Project which will culminate in the restoration of commuter rail service to South Station on the Middleboro and Plymouth branches. Additional environmental and engineering analysis is underway for the Greenbush Branch. Daily ridership of about 15,000 is anticipated. Preliminary design is underway for commuter rail operation to Worcester on the B&A line (the present terminus is Framingham) and for a Stoughton Branch extension to Taunton. Final design is underway for an eight-mile commuter rail extension between Ipswich and Newburyport north of Boston with a projected daily ridership (additional) of 400 passengers. Feasibility studies have been conducted for extensions to New Bedford and Fall River.

Construction is now underway for an air rights bus terminal (and subsequent parking garage) over the South Station platforms, which will enhance South Station's intermodal passenger capabilities.

Feasibility studies have been conducted for a rail link ("connector") between North Station and South Station in conjunction with the Central Artery/Third Harbor Tunnel Project. This connection would enable Amtrak services to operate beyond the present Northeast Corridor terminus to points north of Boston without requiring passengers to change trains. The connection would also enable through routing of MBTA commuter rail operations from the "south side" to the "north side." A possible pairing of these routes is shown in Figure 3.3. Such an operating regimen would put an end to North and South Stations' operation as stub-end commuter terminals and would significantly alleviate the attendant congestion caused by back-up movements to storage yards.

Intercity Passenger Rail

Massachusetts is engaged in a joint study with New York State of the feasibility of instituting Maglev service in the Boston to Albany Corridor.

Freight – Intermodal Capacity Improvements

A major freight development issue is the expansion of double stack container movements, particularly as concerns the extension of transcontinental "land bridge" services directly to two Port of Boston facilities; Moran Terminal in Charlestown and Conley Terminal in South Boston. In order to reach Conley, clearances will have to be increased on the GTI route between Ayer and Cambridge on trackage owned by the MBTA. Similarly, Conrail presently cannot operate double stack trains east of Worcester and the Boston & Albany Line does not reach Conley Terminal. Therefore, clearances would have to be increased along a Worcester-Framingham-Walpole-Readville-South Boston route. The likelihood of increased container movement on GTI has resulted in expressions of concern (about diversion of traffic) from the Providence and Worcester which operates two intermodal facilities in Worcester. The pending state transportation bond package contains \$200 million for as-yet unspecified railroad freight clearance improvements.

Beacon Park Redevelopment

A tangential issue for Conrail is a proposed biomedical facility development scheme for the Beacon Park yards. This would require relocation of Conrail's existing operations to an undetermined location. Discussions with representatives of EOTC indicated that such a relocation is a long-term possibility at best.

Springfield Union Station – Intermodal

The Pioneer Valley Transit Authority (PVTa) has conducted feasibility studies to examine options associated with the development of the former rail passenger station as a rail-bus-parking intermodal facility. The implementation schedule is uncertain, based on funding concerns and the continued ownership of the station by a private individual.

3.4.5 Maine

Boston – Portland Rail Passenger Service

The state has completed environmental impact studies for the restoration of Boston-Portland intercity rail service. To be operated by Amtrak, the service would encompass a route of 115 miles via MBTA and GTI trackage between Boston North Station and Portland with six intermediate station stops. Initial operations will provide four round trips daily. Operating deficits would be funded by Massachusetts, New Hampshire and Maine under a "403b" arrangement. (New Hampshire participation is at present uncertain.) Early start-up is projected for late 1994.

CP Rail System

The state is also seeking to forestall the January 1, 1995 abandonment of Canadian Pacific's Montreal-St. John route as located within the State of Maine. Via Rail, the national passenger railroad operator in Canada, operates a triweekly train, the "Atlantic," over this route. Discontinuance of this route would leave the state with no rail passenger service. GTI has expressed interest in purchasing the eastern portion of the route from Mattawamkeag to St. John, a distance of approximately 180 miles. The principal shipper on

the line is Georgia Pacific which ships about 3,500 carloads per year from its pulp, paper and lumber facilities at Woodland, Maine. The U.S. (Maine) segment of the CP line is subject to ICC abandonment processes, and the state has formally object to abandonment of the line by CP at ICC hearings during 1994.

Auburn Intermodal Facilities

The state has also assisted in helping the planning process for a transshipment facility which will be located in Auburn and served by the St. Lawrence and Atlantic Railway. Operated by Auburn Safe Handling, Inc., the facility will transfer perishable foodstuffs shipped to the site by railroad to trucks for redelivery elsewhere.

A second facility is being constructed for general transshipment use by the City of Auburn in conjunction with the Saint Lawrence and Atlantic. The railroad recently reached an agreement with Canadian National to provide through service between Maine and Chicago, which may eventually include double stack service.

3.4.6 New Hampshire

Commuter Rail

Consideration is being given to extending the MBTA commuter rail line which now terminates in Lowell to Nashua. In 1989 legislation was passed that created the Nashua Passenger Rail Advisory Committee, comprised of state and local officials, planning and industry associations, private citizens and a representative of Guilford Transportation Industries. There presently is no definite implementation schedule for this project. An extension to Plaistow (north of Haverhill, MA) is also being considered by state and local officials.

Freight Transportation Centers

Under the heading of "Intermodal Policy," the "1991 State Rail Plan – Update" states that the Department of Transportation is investigating six sites for the development of industrial transportation centers. The site at Walpole is being pursued as a rail unloading/loading facility from which businesses could ship or receive materials by rail, even though the business themselves may not be located on a rail line. No schedule for implementation is given.

3.4.7 Vermont

Commuter Rail Service

The "Vermont Rail Feasibility Study" proposes development of a commuter rail system centered on Burlington and extending on three branches to St. Albans, Barre and Rutland. Potential station locations have been based on the "Vermont Public Transit System Plan." Burlington would be the site of an intermodal terminal with a shuttle service being provided by the Chittenden County Transportation Authority to distribute passengers to

their final destinations. A suggested initial commuter rail demonstration project would operate between Burlington and Charlotte (the location of New York ferry service) at half-hour peak frequencies and one-hour off-peak and special service. Also being considered is an extension of this service to the major IBM plant in Essex, northeast of downtown Burlington.

Tourist Rail Service

The state has also identified a concept for a tourist train service that would connect Burlington, Bolton, Montpelier, White River Junction, Bellows Falls, Rutland, Middlebury and return to Burlington. This loop service would require attractive connections to each tourist/traveler's ultimate destination. These linkages would be public/private partnerships to enhance the existing systems throughout the loop region. The details of this system, as well as its financial feasibility are under investigation at present.

Freight

Vermont is interested in the development of intermodal freight facilities at Rutland, Burlington, White River Junction and other locations, and is pursuing improvements to allow double stacking on the CV.

■ **3.5 Implications for Next NETI Phases**

The inventory phase has indicated a dichotomy with respect to the development and operation of passenger and freight rail projects. Sponsorship of passenger services (directly and indirectly) by the public sector has led to a maturing process in terms of interagency operating agreements, planning and data reporting. This is witnessed by the readily available documentation and data, including ridership statistics, for intercity and commuter passenger rail services. Subjects for upcoming NETI phases are likely to focus on institutional issues concerning the expansion of services and the perennial questions concerning funding.

Freight operations, however, continue to be a creature of the private sector, albeit with public sector involvement in capital facilities, track rehabilitation and ownership of abandoned lines. Since various state reporting requirements differ, there is a lack of overall uniform data with respect to the volume and type of commodities handled. This situation is compounded by pending sales and abandonments of some freight routes, which contributes to an overall state of flux. However, plans are now being developed for substantial public sector investment in critical intermodal freight routes and facilities.

Based on review of various state planning documents, it is also evident that individual states are looking to develop on-line intermodal freight facilities (of varying capacity) in order to develop local freight traffic. This "home team" approach appears to be developing without a regional focus and the trend, if unchecked, could lead to duplication and underutilization of such facilities.

These situations would tend to confirm the need for a regional approach, as is the intent of this Project.

The presentation of the inventory has been focused to suggest a New England regional core rail network, but the inventory has been sufficiently broad-based to allow various alterations during the course of the study. Indeed, the pending sales and abandonments of routes, as identified in the report, suggest that a totally fixed regional network should not be identified at this time. However, the upcoming "Objectives" and "Trends" tasks should seek to reach a consensus on an "initial" regional core rail network with attendant terminal facilities.

Identification of such a network should include issues such as the provision of parallel or duplicative routes, which may be needed due to natural or man-made events. Certainly the extensive flooding in the Midwest during the summer of 1993 demonstrated the desirability, if not outright necessity, of providing detour routes within a core rail network.

A final issue of concern to the rail and intermodal focus is the long-term competitive position of the Port of Boston with respect to international maritime freight shipments. In November 1993, a group of five major North Atlantic carriers agreed to suspend service to the Port until April of 1994. This group accounts for 40 percent of the Port's volume. Such market issues need to be integrated into the planning process for the investment required for tunnel clearances and rail infrastructure improvements to serve the Port. The November 15, 1993 issue of "Traffic World" notes that a "handful of mega carriers that increasingly determine whether a port is successful have been looking south to ports like Baltimore, Hampton Roads and Charleston to position themselves for their intermodal centers and partnerships. Boston is currently in a classical pincer movement that should undercut its operating revenues."

The perceived viability of the Port will, in turn, drive much of the focus of intermodal rail freight development, depending on whether the regional rail network will function as part of a true "land bridge" or simply as a distribution network for imported and domestic cargoes destined for the New England region.

A major effort was undertaken by the New England Transportation Consortium (NETC)¹ in 1990/1991. The objective of the study was to identify effective state strategies to promote the long-term health of the New England rail system and to identify its minimum core rail system. The final report summarizes the status of New England Railroads and identifies the policy options available for improving rail freight transportation in the Region. The basic findings are summarized as follows:

1. There is a well-defined New England rail system consisting of 27 railroads that operate exclusively within the Region, along with portions of Conrail, Canadian National, Canadian Pacific, and Amtrak.

^{1/} "Rail Service in New England," Final Report April 1992, Research conducted by the NETC by C.D. Martland, P. Little, and A.E. Pereira.

2. The major commodities moving on the New England system include lumber/wood products, pulp and paper products, non-metallic minerals, chemicals, stone/clay/glass, transportation equipment, intermodal trailers and containers, and farm products.
3. The amount of freight moving by rail in New England has declined steadily since the end of World War II, reflecting primarily the emergence of a competitive trucking industry and the shift to a service-oriented economy.
4. Increases in truck size/weight limits have the potential to reduce truck operating costs and thereby shift some traffic from rail to truck. However, the operating benefits for motor carriers will be offset to some extent by increases in public costs and negative externalities, including construction and maintenance costs related to pavement and bridges as well as potential reductions in safety, fuel efficiency, and air quality.
5. Despite substantial reductions in route mileage, the N.E. rail system still has a great deal of light density trackage, and further abandonments may be justified. The existing procedures appear to be adequate for dealing with abandonments.
6. The most critical portion of the N.E. system has been identified as the passenger lines, the mainlines of the major regional railroads (CR, GTI, CV, P&W, and B&A), connections to the regional ports (New London, Albany, Boston, Providence, Quonset Point/Davisville, Portland, Bucksport and Searsport) and connections to the rest of the national rail system via Conrail, CP., and CN.
7. Analysis of rail vs. truck costs shows that local rail service between New England points is normally justifiable only for high-volume movements of bulk commodities. Indeed, there are several examples of short line railroads that exist primarily to serve such movements. Rail becomes more competitive for longer distance moves to or from New England. Rail could also become more competitive as a result of significant improvements in operating efficiency.
8. The incremental highway costs attributable to heavy trucks, which are incurred by states, can be a substantial percentage of trucking prices. Hence, the extent to which these costs are covered by users fees is an important factor in rail/truck competition. Since these added highway costs will be higher on state and local roads than on the Interstate highway system, a balanced system of user fees would take into account the type of road as well as the weight and distance traveled.

The recommendations of the report are summarized as follows:

1. From a regional perspective, the most important concerns are the continued existence of an efficient, financially stable freight rail system that a) serves major N.E. industries, b) provides access to potential sites for rail-intensive industrial development, c) provides intermodal connections, and d) provides efficient access to the national and Canadian systems.

2. A regional focus will be helpful a) in dealing with interstate railroads that serve N.E., b) in dealing with additional freight transportation issues (including trucking and port developments as well as railroads), c) in coordinating freight and passenger (current and potential) operations.
3. Coordination with industrial development, environmental, and energy policies is important. The states should work together to ensure efficient rail access to a limited number of prime development sites within each state. They should work with New York and Canadian officials on broader issues concerning access to the national networks. To a great extent, the kind of industrial development that the Region promotes will determine the potential for rail traffic within the Region.
4. The N.E. states acting together should support equitable treatment of rail vis a vis other industries with respect to Federal Employees Liability Act (FELA), retirement, and other areas where railroads currently are treated uniquely by federal legislation.
5. Railroad management and railroad labor should work together to promote more efficient operating procedures.
6. The N.E. states should produce and, periodically, update a regional rail plan. State rail representatives should continue to meet to discuss regional rail issues, exchange information, monitor rail service, coordinate rail policy, and supervise research. They should seek funding from state and federal agencies to support continued analysis of regional railroad problems. Involving railroad and customer representatives in periodic regional forums would be very beneficial.

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Tables

Table 3.1 New England Railroads

Railroad Name	Type	States	1989 Carloads	NE Miles Operated*
Amtrak	Class I	CT MA RI	n/a	1,048
Canadian National (CN)	Class I	VT	n/a	3(34)
Canadian Pacific (CP)	Class I	ME VT	n/a	292 (292)
Consolidated Rail Corp. (CR)	Class I	CT MA	n/a	400
Bangor and Aroostook RR (BAR)	Regional (Class II)	ME	53,000	435 (435)
Central Vermont Railway (CV)	Regional (Class II)	CT MA NH VT	34,903	425 (425)
Guilford Transportation Industries (GTI)	Regional (Class II)	CT ME MA NH VT	n/a	1,200
Providence and Worcester RR (PW)	Regional	CT MA RI	40,045	233 (354)
Bay Colony RR (BCLR)	Local	MA	2,500	102 (105)
Belfast and Moosehead Lake RR (BML)	Local	ME	86	33
Claremont Concord Railway Corp. (CCRR)	Local	NH	517	4 (4)
Clarendon and Pittsford RR (CLP)	Local	VT	n/a	23
Connecticut Central Railroad Co. (CCCL)	Local	CT	n/a	17
Fore River Railway Company, Inc. (FRY)	Local	MA	537	0 (2)
Green Mountain Railroad Corp. (GMRC)	Local	VT	2,071	50 (50)
Grafton and Upton RR (GU)	Local	MA	247	15 (15)
Housatonic Railroad Co. (HRRRC)	Local	CT/MA	n/a	80
Lamoille Valley RR (LVRC)	Local	VT	137	98 (121)
Maine Coast Railroad (MCR)	Local	ME	0	91
Milford-Bennington (MB)	Local	NH	n/a	16 (16)
New England Southern RR Co., Inc. (NEGS)	Local	MA NH	1,937	51 (77)
New Hampshire Central (NHC)	Local	NH	n/a	9 (9)
New Hampshire Northcoast Corp. (NHN)	Local	ME NH	4,400	48 (48)
New Hampshire and Vermont RR Corp. (NHVT)	Local	NH	500	81 (81)
Pioneer Valley Railroad (PVR)	Local	MA	2,465	26 (26)
St. Lawrence and Atlantic RR Co. (SLR)	Local	ME NH VT	8,864	164 (165)
Vermont Railway (VTR)	Local	VT	8,512	129 (129)
Aroostook Valley RR (AVL)	Switching and Terminal	ME	332	9 (9)
Berlin Mills Railway (MBS)	Switching and Terminal	NH	3,703	10 (11)
Massachusetts Central RR Corp. (MCER)	Switching and Terminal	MA	4,361	24 (26)
Seaview Transportation Corp. (STC)	Switching and Terminal	RI	800	4 (30)
Twin State Rail RR Company (TSRD)	Switching and Terminal	NH VT	720	0 (28)
Washington County RR Corp. (WACR)	Switching and Terminal	VT	254	13 (13)

* Includes State-Owned Mileage; Numbers in Parentheses include total mile of road operated (trackage rights).

Sources: Profiles of U.S. Railroads – 1990 Edition, Association of American Railroads.

"Rail Service in New England – Final Report" MIT, 1992.

Table 3.2 Commodities Handled in New England (1989)

Railroad	Most Important Commodities
Amtrak	Small Package Service, U.S. Mail
AVL	Pulp/Paper (62%), Lumber/Wood (14%), Chemicals (11%)
BAR	Lumber/Wood (46%), Pulp/Paper (29%), Petrol/Coal (16%)
BCLR	Lumber/Wood (31%), Waste/Scrap (26%), Clay/Glass/Stone (11%)
BML	Nonmet Minerals (30%), Lumber/Wood (30%), Food/Kindred (9%)
BMS	Pulp/Paper (57%), Waste/Scrap (12%)
CN	Lumber/Wood, Pulp/Paper
CP	Not Available
CCCL	Not Available
CCRR	Nonmet Minerals (67%), Lumber/Wood (19%), Pulp/Paper (10%)
CLP	Not Available
CR	Automobiles, Containers, Lumber
CV	Lumber/Wood (33%), Pulp/Paper (27%), Clay/Glass/Stone (10%)
DH	Fuel
FRY	Chemicals (92%), Food/Kind (4%), Nonmet Minerals (2%)
GMRC	Nonmet Minerals (89%), Petrol/Coal (5%)
GU	Nonmet Minerals (100%)
HRRC	Nonmet Minerals, Plastics
LVRC	Prim Metal (53%), Lumber/Wood (20%), Farm Prod (15%)
STC	Not Available
MCER	Misc Mixed Shipment (83%), Chemicals (8%), Coal (8%)
NEGS	Farm Prod (41%), Chemicals (30%), Lumber/Wood (12%)
NHN	Nonmet Minerals (100%)
NHVT	Pulp/Paper (70%), Chemicals (20%)
PVRR	Lumber/Wood (35%), Chemicals (21%), Pulp/Paper Prod (16%)
PW	Chemicals (13%), Pulp/Paper (23%), Farm (14%), Containers (40%)
MCR	Concrete
ST (GTI)	Not Available
TSRD	Lumber/Wood (65%), Pulp/Paper (15%)
VTR	Clay/Glass/Stone (26%), Petrol/Coal (25%), Nonmet Minerals (12%)
WACR	Transp. Equip. (55%), Lumber/Wood (27%)

Source: "Rail Service in New England – Final Report," MIT 1992; and Individual Railroads.

**Table 3.3 Amtrak – Fiscal Year 1992 Ridership by Station
in New England**

Station	FY 1992		
	Ons	Offs	Total
Amherst, MA	1,714	1,757	3,471
Bellows Falls, VT	1,157	1,261	2,418
Berlin, CT	18,012	18,610	36,622
Boston Back Bay, MA	71,503	39,076	110,579
Boston South Station, MA	391,699	421,676	813,375
Brattleboro, VT	2,968	3,074	6,042
Bridgeport, CT	28,170	30,696	58,866
Burlington – Essex Junction, VT	9,309	8,589	17,898
Claremont, NH	1,080	1,052	2,132
Framingham, MA	4,055	4,426	8,481
Hartford, CT	92,898	94,182	187,080
Hyannis, MA*	NA	NA	2,358
Kingston, RI	32,782	33,714	66,496
Meriden, CT	17,724	19,225	36,949
Montpelier, VT	5,558	6,658	11,216
Mystic, CT	7,600	10,235	17,835
New Haven, CT	139,882	141,262	281,144
New London, CT	71,479	71,926	143,405
Old Saybrook, CT	20,567	22,120	42,687
Providence, RI	148,719	152,462	301,181
Route 128, MA	78,468	66,696	145,164
Saint Albans, VT	2,009	2,604	4,613
Springfield, MA	76,257	77,291	153,548
Stamford, CT	104,618	106,126	210,744
Wallingford, CT	7,385	8,813	16,198
Waterbury – Stowe, VT	2,578	2,712	5,290
Westerly, RI	8,461	9,478	17,939
White River Junction, VT	10,095	10,034	20,129
Willimantic, CT	986	1,146	2,132
Windsor Locks, CT	11,192	12,070	23,262
Windsor, CT	1,802	2,050	3,852
Worcester, MA	20,333	19,800	40,133

* Seasonal/summer service only.

Note: Amtrak's Fiscal Year runs from October to September.

Source: National Railroad Passenger Corporation.

Table 3.4 New Haven Line 1992 Ridership (Inbound)

	A.M. Peak		Weekday Off-Peak Inbound		Saturday Inbound		Sunday Inbound	
	On	Off	On	Off	On	Off	On	Off
New Haven	950	0	1,148	0	2,029	0	1,719	0
Milford	544	18	350	22	475	35	394	36
Stratford	481	12	110	51	127	23	140	14
Waterbury	37	0	66	0	87	0	68	0
Naugatuck	15	3	15	1	31	1	18	0
Beacon Falls	7	0	2	0	8	2	10	0
Seymour	9	1	13	3	24	10	18	8
Ansonia	7	0	23	7	18	8	14	7
Derby Shelton	18	2	10	3	19	4	16	3
Bridgeport	478	127	630	340	873	389	658	271
Fairfield	2,013	91	496	86	741	53	659	33
Southport	153	9	25	2	8	3	24	1
Green's Farms	558	14	44	3	9	3	20	0
Westport	1,782	94	642	84	769	119	876	76
East Norwalk	475	49	37	38	31	19	27	2
Danbury	100	0	65	0	101	0	77	0
Bethel	119	0	10	0	28	0	24	0
Redding	52	1	10	4	19	4	17	1
Branchville	153	5	15	5	29	5	23	8
Cannondale	109	0	9	0	20	7	27	8
Wilton	225	10	5	4	24	13	24	7
Kent Road	2	14	0	0	0	0	0	0
Merritt 7	112	13	4	2	8	5	8	2
South Norwalk	766	190	427	317	601	418	490	301
Rowayton	515	5	29	7	12	2	22	2
Darien	1,146	28	369	51	473	40	445	30
Noroton Heights	946	2	126	24	277	20	225	21
New Canaan	1,003	0	253	0	286	0	281	0
Talmadge Hill	406	1	53	0	49	3	67	5
Springdale	341	0	50	12	54	9	67	12
Glenbrook	373	1	30	17	53	14	54	21
Stamford	2,571	1,021	2,066	934	2,527	1,074	2,270	1,049
Old Greenwich	829	13	257	31	201	10	197	12
Riverside	527	5	134	8	114	10	110	7
Cos Cob	706	30	223	15	143	18	117	15
Greenwich	1,835	224	1,150	144	798	140	770	139
Port Chester	1,050	56	780	295	828	312	743	179
Rye	1,621	27	780	52	622	77	599	42
Harrison	1,410	31	515	72	497	77	424	50
Mamaroneck	1,331	27	652	91	658	127	533	116
Larchmont	2,644	29	678	82	785	73	624	91
New Rochelle	1,716	90	981	447	1,048	381	762	300
Pelham	1,836	15	478	117	587	71	420	103
Mount Vernon	935	84	397	597	524	480	285	324
Fordham	2	243	9	902	15	813	9	721
125th Street	10	313	16	576	7	827	5	680
Grand Central	0	30,008	0	8,736	0	10,935	0	9,680
Waterbury Branch Totals	93	6	129	15	187	26	143	19
Danbury Branch Totals	873	43	119	16	230	35	201	27
New Canaan Branch Totals	2,124	2	387	28	443	26	470	38
Total Connecticut Portion	20,362	1,984	8,898	2,217	11,067	2,465	9,977	2,093
New Haven Line Totals	32,918	32,908	14,185	14,185	16,638	16,638	14,379	14,379

Figures

Figure 3.1 New England Railroad Network

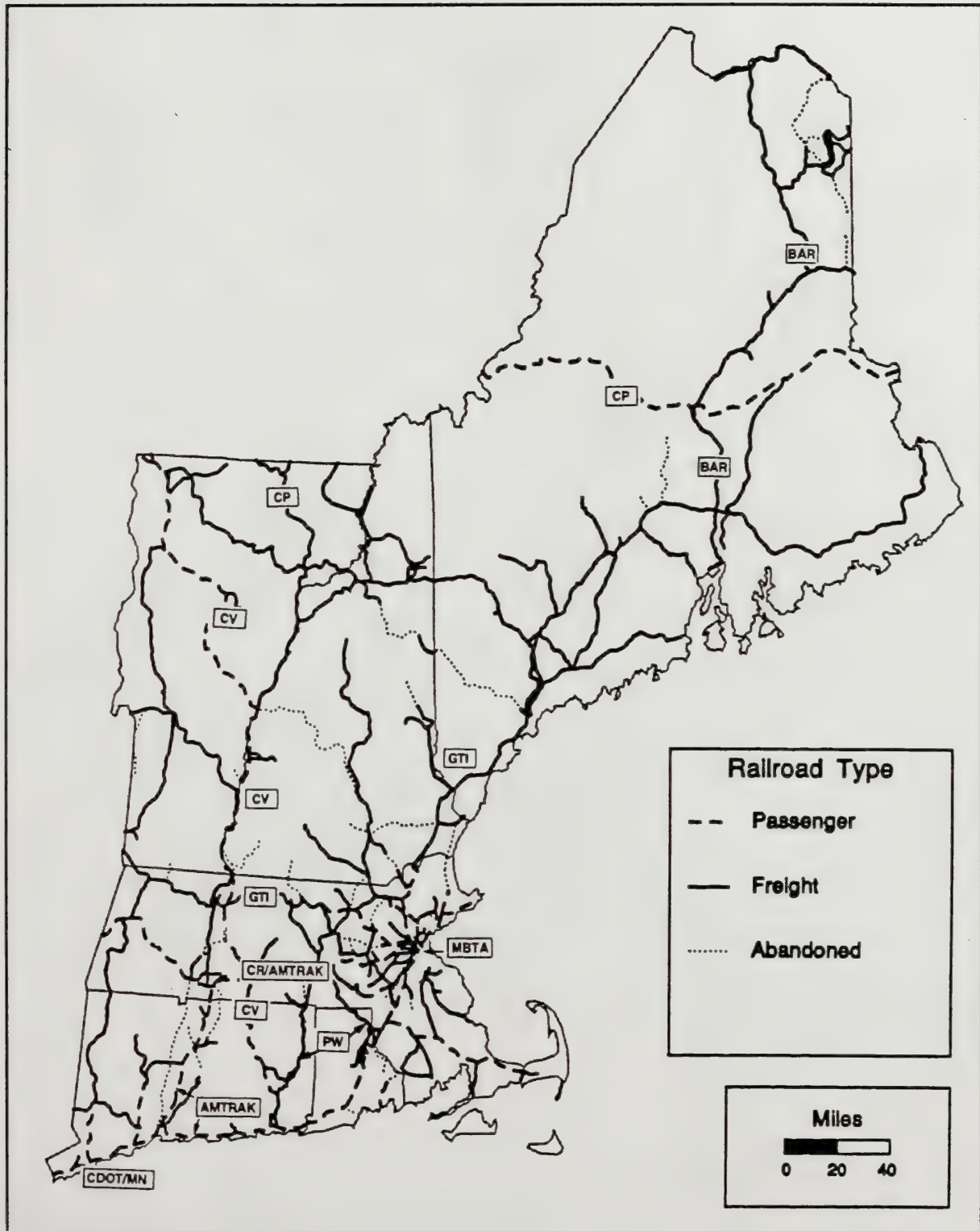
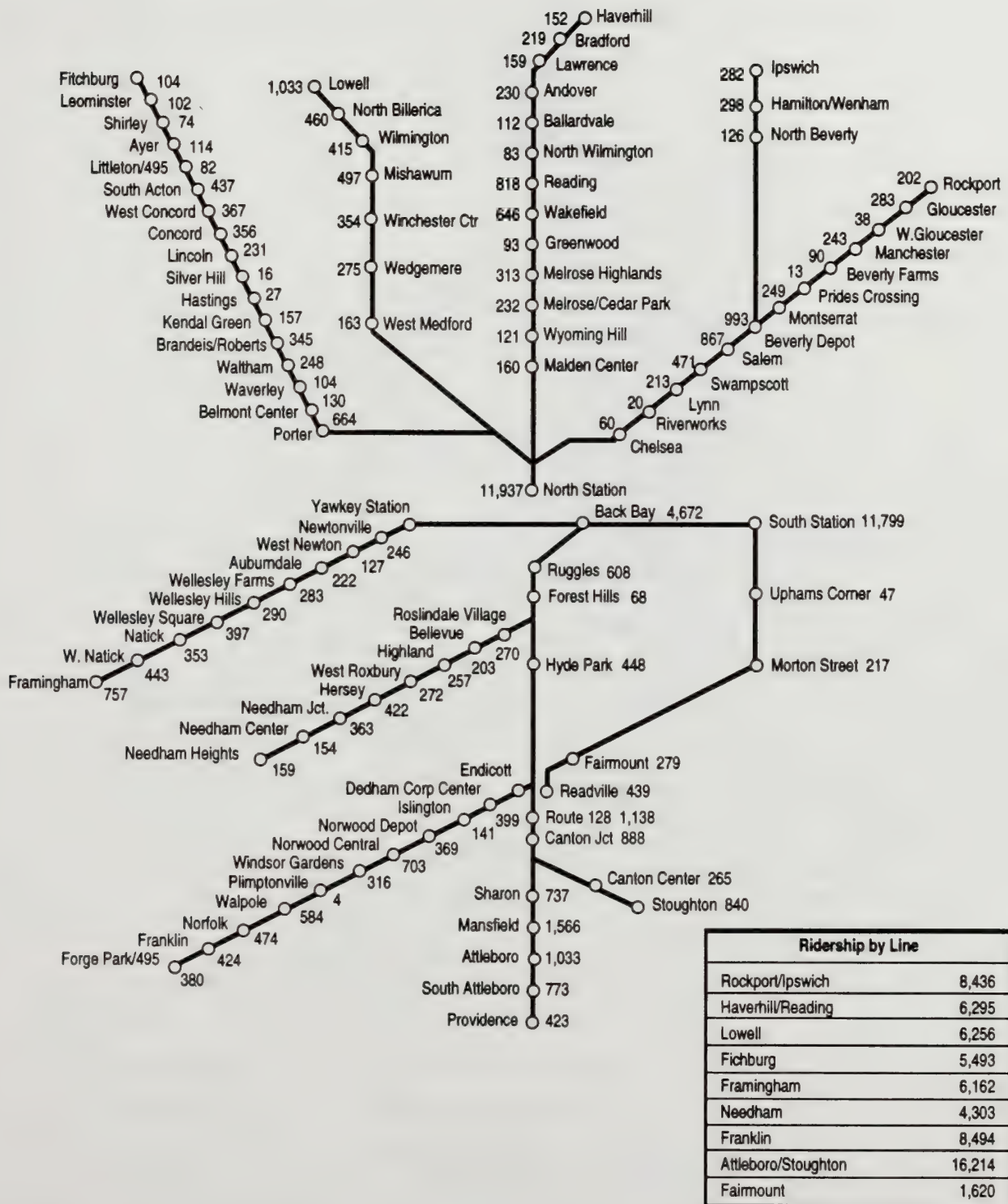
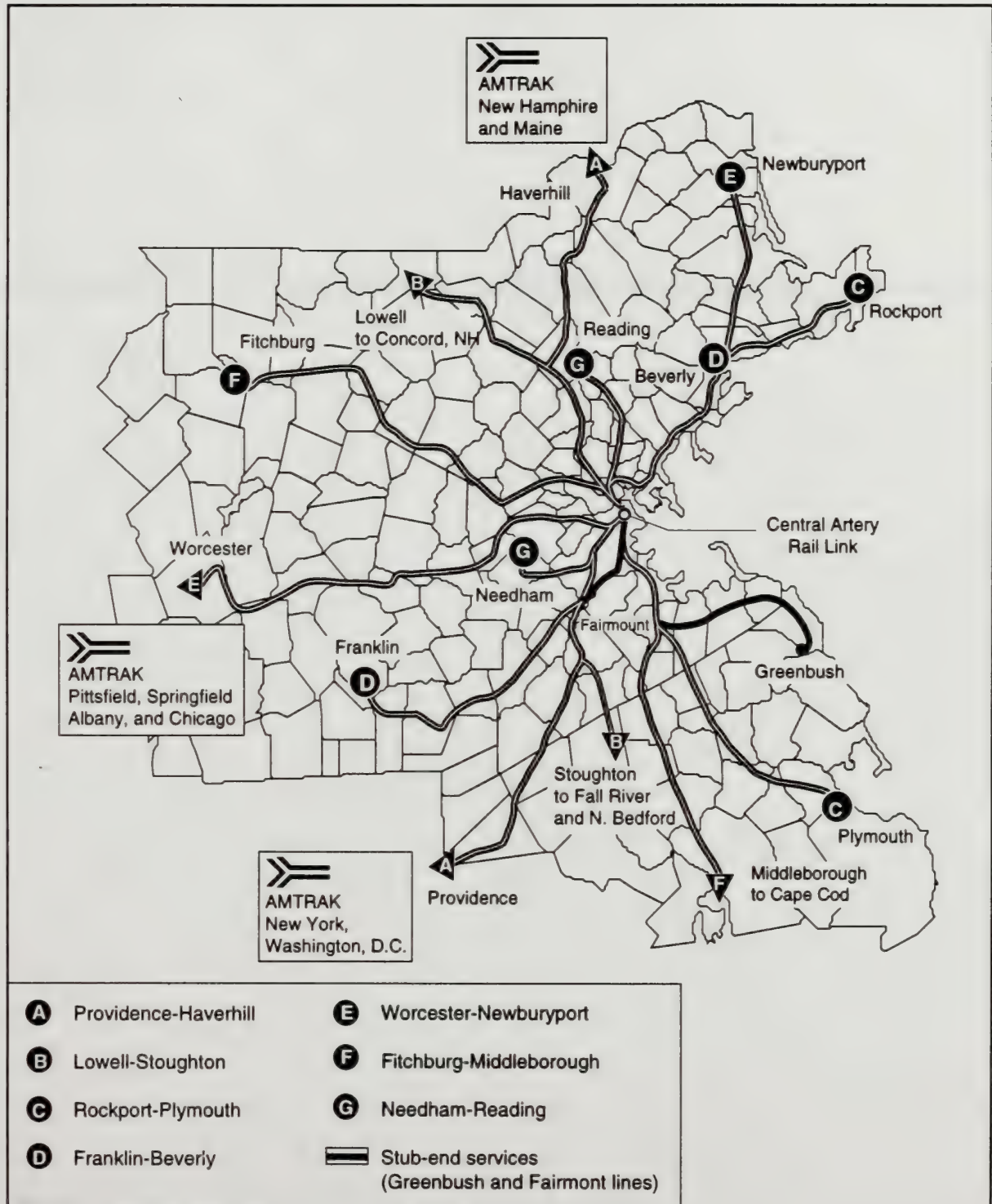


Figure 3.2 MBTA Commuter Rail – Weekday Boardings by Station



Source: CTPS estimates based on April 1992 commuter rail survey and April 1992 Amtrak revenue figures.

Figure 3.3 Future Eastern Massachusetts Regional Rail Routes



4.0 *Airports*

Chapter 4.0 – Airports

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4.0 Airports

■ 4.1 Key Issues/Focus

Planning for air travel in New England requires consideration of both physical and operational characteristics. The former includes airports, ground access infrastructure, navigation and communication aids, etc. The latter includes demand-capacity aspects, airline service networks, airport operations, air traffic control, weather services, etc. The focus of this planning effort is on regional cooperation among the six individual New England states. As such, this analysis concentrates on those air transportation characteristics that are believed to have the greatest need for regional cooperation. Only items that are of regional significance are included. Furthermore, while aviation is at present the only form of high speed transportation service in the U.S., the implementation of high speed ground transportation is possible. Based on these constraints, the fundamental issue of this study is how to develop a coordinated plan to accommodate the demand for air travel in New England. The questions that must be answered include:

- Do the capacities and locations of the airports in New England adequately accommodate the demand for air travel services?
- What ground access services should be provided to the airports in New England to accommodate travel demand within environmental, funding, and political constraints?
- Do the route and fare structure in New England support the travel needs for passengers and freight within and outside the region?
- What is the future of federal subsidy programs which support primarily smaller airports such as the Airport Improvement Program (AIP)?

The planning and operating of airport facilities and their interfaces to the surface transportation network represent the areas where the six individual states have the greatest potential to influence the air transportation system. Many other aspects of air travel, such as air traffic control, weather services, and the airspace structure are functions of the federal government, and therefore less easily controlled by the individual New England states. Other aspects such as demand patterns and airline services are driven by market forces, and are difficult to influence through a state level planning process. While these issues cannot be ignored in the development of a regional cooperation plan, the emphasis of the plan will be on the airports that serve the region.

Since this study is limited to issues of regional significance, only a subset of all of the New England airports could be considered. Air transportation encompasses both passenger and freight activity; the former is further subdivided into pleasure vs. business flying, whereas

the latter consists primarily of business-related activity. All three of these aviation services are of significance to the New England economy. Consequently, the approach selected for this study was to consider the airports featuring the highest passenger and freight activity on an individual basis. These airports and their share of regional enplanements are shown in Figures 4.1 and 4.2. Airports featuring lower levels are not excluded from this analysis, but are consolidated by State.

The majority of air freight, whether cargo or mail, is typically accommodated by the same airports that handle most passenger traffic. This is due to two reasons: (1) most air freight is carried in the cargo (i.e., "belly") holds of passenger aircraft; and (2) the origin-destination patterns for freight largely mirror those of business passengers. The major air freight airports in New England are also the major passenger handling facilities. In particular, of all New England airports, Logan International Airport features both the highest levels of passenger and freight activity. It should also be noted that despite several proposals to develop all-cargo airports in New England, there are currently no such facilities operating.

Given the similar demand patterns between air freight and passenger air travel in New England, the categorization of airports was based on enplanement statistics. Unlike freight data, detailed statistics on passenger activity are readily available. To achieve consistency among individual airports, the principal source of statistics is the set of annual reports published by the Federal Aviation Administration (FAA). The drawback of using this source is that timely reporting of data is not available. For example, enplanements data for fiscal year (FY) 1991¹ were published in July 1993. Table 4.1 lists all airports with significant levels of scheduled passenger services² sorted in order of total annual enplanements.

The table also displays the designation of each airport according to the National Plan of Integrated Airport Systems (NPIAS).³ This is a federal plan that identifies existing and proposed airports that are important for national air transportation. NPIAS identifies a service level for each airport, of which two are of significance to this study: "Commercial Service – Primary" and "Commercial Service – Other." An airport role is also defined. For air carrier airports, the airport role reflects the routes and markets that are served nonstop. The applicable definitions are Long Haul (over 1,500 miles), Medium Haul (500-1,500 miles), and Short Haul (less than 500 miles).

The list of airports presented above contains all of the New England airports designated by NPIAS as "Commercial Service – Primary," except Pease International Tradeport which is a new facility (for civilian operations). Some airports with the "Commercial Service – Other"

¹/ Unless otherwise noted, all aviation statistics are based on the federal fiscal year (FY), which begins on October 1 and ends on September 30. However, for the region-wide long-range conceptual planning conducted here, the three-month discrepancy between the federal fiscal year and calendar year is mostly negligible.

²/ Defined as airports with greater than 5,000 annual enplanements based on FY 1991 data published in the FAA *Terminal Area Forecasts*, July 1993.

³/ Federal Aviation Administration, *National Plan of Integrated Airport Systems (NPIAS): 1990-1999*, March 1991

designation were included by the virtue of having more than 5,000 annual enplanements. It is estimated that the few airports that have scheduled service with less than 5,000 annual enplanements (e.g., Keene Municipal Airport) generate less than 10,000 annual enplanements combined.

To limit the list to airports of "regional significance," the top seven airports from Table 4.1 were used. Together, these airports account for more than 95 percent of the region's total annual enplanements. In addition, however, it was decided to include Worcester Municipal Airport and Pease International Tradeport. These nine airports are listed in Table 4.2. Figure 4.1 shows the regional share of enplanements by airport; Figure 4.2 shows total enplanements. The former is emerging as an important alternative to expanding capacity to the market served by Logan International Airport, which currently accounts for approximately 60 percent of the region's enplanements. The latter has only been providing scheduled services since March 1993, and is still a maturing facility, but the development plans for Pease project long-term activity levels similar to Portland International Jetport. Its proximity to Logan International Airport also warrants that it be included on the list of airports of regional significance.

The list in Table 4.2 shows the nine airports that were selected for consideration on an individual basis by this study. These are the facilities that are thought to be very important in terms of planning region-wide air transportation needs. This is not meant to imply that the other air carrier airports in the region are not significant. In many cases, for example Northern Maine Regional Airport in Presque Isle, these smaller regional airports provide vital links to the national transportation infrastructure.

The emphasis of this study is on the transportation of people and freight, and therefore on the absolute numbers of enplanements and cargo tonnage. As a result, the focus is placed on airports with scheduled passenger services. While this approach provides the most practical way to limit the number of facilities to be analyzed, it tends to underestimate the importance of the role of general aviation. Besides the 23 airports listed above, there are nearly 200 other public airports and 400 private airports in the region that are only accessible through general aviation services. Other facilities only accessible by general aviation aircraft include seaplane bases and heliports. General aviation is of particular importance in New England where distances between major business centers are well within the range of the general aviation fleet and intra-regional scheduled service is limited. Furthermore, general aviation provides resources for law enforcement, utility companies, emergency services, tourism, and education. While the large number of general aviation facilities prohibits individual consideration of smaller airports, the study will consider general aviation on a consolidated basis by state.

■ 4.2 Methodology

The approach of this study is to consolidate existing planning efforts conducted by individual airports and state aviation organizations into a comprehensive plan of

cooperation. While the goal is to rely on completed plans to the greatest extent possible, original analysis will be conducted when required. The goal of the inventory phase is to identify the status and future trends of the New England air transportation network. A limited set of aviation activity indicators was collected. The data collection effort was based primarily on existing documents, updated with telephone conversations and written requests for information. Points of contact included operators of major commercial airports, state and federal aviation agencies, and air transportation industry representatives. The focus of the inventory was on growth trends, development plans, preferred forecasts, origin and destination (O&D) travel patterns, landside access, perceived regional cooperation needs, potential for intra-regional air service, and the emerging role of regional airlines. The following sections describe the methodology in more detail.

4.2.1 Existing Documents

The conclusion of the chapter contains a list of references collected as part of the inventory process. Few, if any, New England-wide planning documents are applicable to air transportation. National FAA reports published regularly provide data for all of New England. They typically do not give consideration to circumstances unique to New England, but cover the entire region as part of a nation-wide study. Typical FAA documents of this nature include the *Terminal Area Forecasts*, *National Plan of Integrated Airport Systems*, and *Air Traffic Activity*.

Lacking New England specific planning documents, the emphasis was placed on statewide plans. The following are typical examples of statewide plans that were collected:

State Airport System Plans

These contain statewide analyses of aviation demand, capacity, and facility improvements. These provide information on statewide aviation programs and airport improvements on a systems basis. They also contain basic aviation activity indicators and forecasts. Scope of work and currency varies from state to state.

Long-range Transportation Plans

ISTEA requires that each State complete a long-range transportation plan. While typically centered on surface transportation needs, some states also include aviation or ground access to airports. These provide information on each state's conceptual plans for airports and ground access (when included in the plan).

Transportation Improvement Programs

Also required by ISTEA are state transportation improvement programs (TIP), which cover shorter periods than the long-range transportation plans. Typically, the TIP covers one to 10 years. The TIP can be viewed as the implementation plan for the long-range transportation plan. It defines specific projects and costs. TIPs are also primarily centered on surface transportation needs, but some TIPs include air transportation capital

improvement plans and projects related to airport ground access. These will provide information on specific short-term projects planned by each state.

The influence of Logan International Airport on the regional air transportation system has manifested itself in the many studies completed for the eastern Massachusetts area. Because Logan captures the majority of enplanements and cargo tonnage in New England, and because it is the only New England airport facing significant levels of delay, it has been the focus of considerable analysis. The studies concentrating on Logan and eastern Massachusetts have regional impacts due to the airport's sizeable market catchment area. This impact is also due to Logan's role as a connector to domestic and international flights from other areas in New England. Hence, recent studies such as the *Second Major Airport Siting Study* and *Strategic Assessment Report* represent the closest attempt at region-wide aviation planning. However, while the outcome of these studies impact nearly all of New England, they cannot be considered regional reports. In most cases, the local sponsors for the studies covering eastern Massachusetts are the Massachusetts Port Authority and/or the Massachusetts Aeronautics Commission.

Individual airport master plans were not collected for this study. However, as described below, the operators of the largest commercial airports were contacted and some airport specific reports were collected when deemed to be of regional significance.

4.2.2 Interviews

In addition to using existing documentation, over 20 airport operators, state and federal agencies, and industry organizations have been contacted as part of this study. The primary method of contact was a written survey, with follow-up telephone conversations. A summary of survey results obtained through this effort to date are shown at the end of the chapter. Table 4.3 contains a list of all interview and survey contacts.

4.2.3 Professional Judgment

The inventory process includes the identification of industry trends, both of regional and airport specific scope. While the documents collected and the results from the interview provide substantial coverage of activity projections, planned projects, and future changes, there is still a need for interpretation of the raw data. Where necessary, the identification of trends and changes was supplemented by the use of professional judgement based on the Consultant's experience in airport master planning, engineering, and state system planning in all six New England states.

■ 4.3 Existing Conditions

New England is a recognized organizational unit in air transportation, emphasized by the boundary of the FAA's New England Region (NER). Key elements of the New England aviation infrastructure include:

Approximately 600 Airports

Of the approximately 600 airports in New England, just over one-third are open to the public (see Table 4.4). Of these, 23 airports have significant levels of scheduled passenger operations; the remainder provide primarily general aviation services. The significance of general aviation is underscored by the fact that only 10 percent of the region's public airports have scheduled air service. Private airports vary from one-aircraft grass strips to highly active airports, but generally do not have the region-wide significance that is the scope of this study.

The term "public airport" actually means "airports open to the public." While many public airports are owned by municipalities, counties, or states, the remainder are privately owned. A private airport owner that allows public access and is designated as a reliever can be eligible for federal grants.

Airspace Structure

The National Airspace System is structured around a network of radio navigation aids connected by low and high altitude airways. The airspace itself is subdivided into three-dimensional blocks with different features. These features are both operational in nature (e.g., subdivision of airspace sectors for distribution of air traffic control workload) and regulatory (e.g., entry and equipment requirements). The network is by necessity independent of state borders and is essentially managed by the FAA, with local input through its regional office. The amount of operational control exerted by the FAA in a given airspace section is generally proportional to the density of air traffic, which in turn is influenced by the level of activity at nearby airports. For example, Logan International Airport is the only facility in New England surrounded by Class B airspace, one of the most restrictive types in terms of entry, pilot qualification, and equipment requirements. It should be noted that much of New England's airspace is part of the highly congested Northeast Corridor. The FAA has an active research and development program to reduce delays in this corridor.

Air Traffic Control

There are generally three types of air traffic control facilities in the U.S.: Air Traffic Control Towers (ATCT), Terminal Radar Approach Control (TRACON) facilities, and Air Route Traffic Control Centers (ARTCC or just "Center"). Additionally, the FAA operates Flight Service Stations (FSS) to provide auxiliary services such as weather briefings and flight plan processing. Of these facilities, the TRACONs and ARTCCs rely exclusively on radar to provide air traffic control services. Some control towers are provided with remote displays of radar images (so-called D-BRITE) but they rely primarily on visual observation of aircraft to provide services. There is one ARTCC facility in New England: Boston

Center, located in Nashua, N.H. It provides radar services in the en route environment. TRACON facilities provide services in the terminal environment and are located at Bangor, Bradley, Burlington, Logan, Manchester, Portland, and Providence airports. In addition, there are several military radar installations which also provide services to civilian traffic, for example at Naval Air Station (NAS) Brunswick, Otis Air Force Base (AFB), and Loring AFB. There are 24 civilian control towers in New England, of which 22 are operated by the FAA, and the remainder under contract. FAA also operates three Automated Flight Service Stations (AFSS) in New England, located in Bangor, Bridgeport, and Burlington.

While portions of the physical air transportation system are region-wide in scope, there currently is little region-wide planning and policy making. Much of the documentation and planning assistance provided by the FAA is presented on a regional basis, but even then it often reflects an assembly of individual efforts associated with each of the six New England states. Considerable control over the infrastructure rests with the individual states or airport sponsors. The following sections describe the current system on a state-by-state basis. The description is focused more on air transportation issues than physical attributes of the airports.

4.3.1 Connecticut

The State of Connecticut, through its Department of Transportation (ConnDOT), owns and operates six public airports, including two of its facilities with scheduled passenger services. One of these, Bradley International, is New England's second largest airport in terms of passenger enplanements. Bradley captured approximately 13 percent of the region's total enplanements in 1991. Bradley is one of three New England airports designated by NPIAS as "primary: long haul." A terminal modernization program at Bradley has recently been completed. Bradley's local demand is drawn primarily from the Hartford, CT and Springfield, MA areas. Key destinations include New York, Chicago, Washington, D.C., and Florida. The ConnDOT survey response indicates that the state's airports serve all markets for which there is a demonstrated demand. It should be noted that the New York metropolitan airports capture a significant portion of the air transportation market in southwestern Connecticut.

Airport revenues received from the State aviation fuel tax and aircraft registration fees are used for improvements, maintenance, and operating expenses at the State owned airports. These funds are also used to partly match federal funds applied to municipal airports. A portion of aviation fuel taxes collected at Bradley are reserved exclusively for improvements at that airport.

Higher fares potentially inhibit Bradley's ability to capture local demand for air carrier services. Fares are not regulated; assuming that the Bradley cost structure for airlines is comparable to competing air carrier airports, fares are determined by market forces. A key contributing factor to fare levels is the number of airlines providing services on a specific route segment. For example, non-stop service to Orlando is offered by only two airlines at Bradley, compared to four each at Logan and Newark.

The remainder of the State's scheduled passenger service consists of commuter operations from New Haven, Bridgeport, and Groton-New London. In the last few years, New Haven has emerged as the dominant passenger facility of these three, exceeding 100,000 commuter enplanements in 1991, more than Bridgeport and Groton-New London combined. Unlike other regional airports in New England, commuter airlines operating at Connecticut's regional airports do not use Logan as their primary connector. Instead, services are provided primarily to Philadelphia, New York, Washington, D.C., and Chicago. Commuter services to Bradley from Connecticut's regional airports are not feasible due to the short distances involved.

A State Airport System Plan was completed for Connecticut in 1986. Airport improvements identified for the State's commercial airports centered on terminal expansions and the construction of new runways and/or taxiways. A recommendation was made to improve scheduled air services at Groton-New London, New Haven, and Bridgeport. The plan also considered methods to promote the use of Bradley. Key general aviation facilities were identified as Hartford-Brainard, Danbury, Danielson, Meriden-Markham, Waterbury-Oxford, and Windham. However, due to the effects of deregulation, the recent economic depression, and the date of the SASP, many of the plan's recommendations now need to be updated. Significant findings of the plan include the identification of land use compatibility problems at Bridgeport, Groton-New London, and New Haven and the sensitivity of commuter operations to the financial success of specific routes, and hence the local economy in the communities served by the regional airports. The Capital Improvement Plan assigned 57.4 percent of total improvement needs to Bradley, 23.2 percent to the three regional airports, and 19.6 percent to the key general aviation airports.

The ConnDOT 1993 *Master Transportation Plan* does not consider air transportation issues in the narrative, nor are any airport ground access problems discussed. However, the appendix contains a list of suggested infrastructure programs which includes two categories related to aviation. The first, "Airports: Development & Improvement" consists of improvement programs at the State's regional and general aviation airports. The total cost for these projects was estimated at \$46 million, of which only \$6 million were identified as assigned funds. Key projects include signage, reconstruction of aprons, taxiways, and runways, general aviation apron expansions, and construction of new taxiways. The second category "Airport: Bradley International" includes \$57 million in improvement projects at Bradley (\$4.5 million in assigned funds). Key projects include ground access improvements, glycol (i.e., deicing fluid) recovery system, purchase of maintenance and snow removal vehicles, new parking garage, sewer renovation system, new taxiway construction, and apron reconstruction. In addition, an eventual light rail service between Hartford and Bradley on the Griffin Line is presently in the Alternatives Analysis phase.

A new Master Plan for Bradley, just released, advocates a doubling of terminal capacity.

4.3.2 Maine

The majority of airports in Maine are municipally owned; the only State owned airport with scheduled service is Augusta State Airport. The State features two airports with regionally significant air carrier service, Portland International Jetport and Bangor International Airport. Both are designated as "primary" airports in NPIAS. Portland provides air carrier and commuter service for most of southern Maine, with key non-stop services to Boston, New York, Washington, D.C., and Chicago, as well as intrastate services to Bangor and Presque Isle. Bangor International Airport serves essentially the same cities as Portland, with lower frequencies, however. More significantly, Bangor has successfully filled a niche market as a stopover point for transatlantic charter flights. This market has allowed the airport to expand its infrastructure far beyond that associated with regional airports in communities the size of Bangor. At over a million annual enplanements handled in 1991, Bangor accommodated nearly seven percent of the region's total enplanements. However, 60 percent of these enplanements represent international passengers, most of whom continue to domestic destinations beyond Bangor. Bangor's domestic enplanements constitute approximately three percent of all regional enplanements, similar to the share attributable to Portland.

Survey responses from the airport managers of Bangor and Portland indicate that most markets for which a demand exists are served. Exceptions include Bangor-Manchester and Portland-Washington/Baltimore.

Scheduled services are also provided at Northern Maine Regional Airport at Presque Isle, Augusta, and Bar Harbor. Of these, the latter two are limited in scope (less than 10,000 annual enplanements each) and are subsidized by the federal Essential Air Service (EAS) program. Northern Maine Regional Airport however, peaked at 40,000 annual enplanements in 1988, with slow decline since. This airport provides an important air transportation link to northern Maine. Future aviation activity levels at this airport will to some extent depend on the level of economic activity following the closure of nearby Loring AFB.

Survey responses completed by the Maine DOT Air Transportation Division indicates that growth in commercial passenger freight operations is expected primarily at Portland and Bangor. The State's regional and general aviation airports are projected to experience slow growth in business and charter activity. Boston is projected to remain the key regional destination for air traffic originating in Maine; hence access to Logan for commuter aircraft remains a key concern for the State. Air transportation is viewed as a key element to economic development in Maine, particularly in less developed areas. The introduction of improved instrument approach systems and weather reporting equipment is seen as a priority for the State's general aviation airports. The economic value of the State's aviation system combined with the limited funds available at the State level highlight the importance of federal funds for the State of Maine, particularly the Airport Improvement Program. The survey response from the Portland International Jetport also emphasizes the concern over funding programs, including the AIP.

A State Airport System Plan was completed in 1991, with emphasis on facility improvements, air service, and economic impacts. While still fairly recent, the SASP has since been updated with studies to investigate the closure of Loring AFB, air service to Northern Maine Regional Airport, and the impact of Logan on the Maine air transportation system. An analysis of the State's commercial service area indicates that northern and western parts of the State may be underserved. Furthermore, with the establishment of Pease as a civilian airport, southern Maine now has overlapping service, which may result in competition between Pease and Portland. Key proposed facility improvements include a parallel runway at Bangor to alleviate long-term capacity constraints, construction of new gates and car parking at Portland, and the development of reliever airports for both Bangor and Portland. Total 20-year development costs for Bangor and Portland were estimated at \$60 and \$29 million, respectively.

The Air Service Study of the Maine SASP investigated the potential for expanded commercial air service in Maine. The study identified over a dozen markets as candidates for expanded service. In the investigation of O&D patterns it was determined that 15 percent of the State's demand is served by Logan, 60 percent by Portland, 20 percent by Bangor, and the remaining five percent by other airports in Maine.⁴

"The financial feasibility analyses produced no potential routes which could be financially self-supporting by 1995. Several potential routes had sufficient demand, but were either too close to existing commercial service airports or already had service to a hub."

Instead, the study recommended that the State should concentrate on protecting its existing service levels. Bangor and Portland should be supported as the main air carrier access points to the State. A recommendation was also made to support the use of charter and air taxi flights to the underserved areas of Maine. An analysis of the potential for intrastate air service indicated that such services would not be feasible without public subsidy.

The Maine short-term Transportation Improvement Program (TIP) for FY 1994-1995 does not specifically address air transportation or airport ground access issues, but includes the State's airport CIP in an appendix. A total of \$29 million in improvement projects are identified, of which \$6 million are for Bangor and Portland. Key projects at Bangor include apron and terminal expansions, apron reconstruction and acquisition of snow removal equipment. At Portland, projects include noise mitigation, construction of an air cargo apron, expansion of the snow removal equipment storage facility, the construction of a parallel taxiway, terminal expansion, installation of signs, and construction of an oil/water separator.

Unlike the TIP, the Maine Transportation Capital Improvement Planning Commission's long-term transportation plan does address aviation directly. It draws primarily on results presented in the SASP, however. The recommendations from the SASP were reiterated, including the primary goal of supporting Bangor and Portland as the key air carrier service

4/ Aviation Planning Associates, Inc., *Maine Aviation Systems Plan: Air Service Study*, December 1991, p. 32

points for the State. In the consideration of intermodal transportation issues, the study recommended increased emphasis in the airport and land use planning process on incorporating connections to other transportation modes. Specifically, the study recommended that non-aviation funds be used to improve surface transportation access to Portland International Jetport.

4.3.3 Massachusetts

With a population level nearly equal the remainder of New England, Massachusetts is a center of aviation activity for New England. Logan International Airport is the region's busiest in terms of enplanements and air cargo activities. It serves as the primary gateway for long haul routes, including most international destinations. Logan experienced over 10 million enplanements in FY 1991. Other Massachusetts airports with commuter service (i.e., Worcester, Nantucket, Hyannis, Martha's Vineyard, New Bedford, and Provincetown) accounted for nearly 400,000 enplanements combined. Of these airports, Worcester appears to have the highest potential to develop into a larger regional airport, possibly off-loading some demand at Logan. The survey response from Massport states the need to explore this possibility in more detail.

Massachusetts' share of enplanements in New England was 63 percent in 1991. Massachusetts population only constitutes 45 percent of the regional total, however. This highlights Massachusetts' role in providing air service access for New England to national and international destinations. Massachusetts' ability to capture this relatively high level of demand is due to the number of markets served and high frequency of departures at Logan. Up to 20 percent of Logan's domestic O&D passengers are estimated to originate outside the immediate Boston area. Residents and visitors in all six New England states make significant use of Logan.

Logan is operated by the Massachusetts Port Authority (Massport), an independent state authority with responsibility for Hanscom Field (Bedford) and non-aviation facilities as well. The Massachusetts Aeronautics Commission provides planning and oversight for statewide issues and airports, except the two operated by Massport. Worcester Municipal Airport is operated by the City of Worcester.

Of all airports in New England, Logan has the highest usage of alternative ground access services. Current services include modes such as subway (10 percent of all passengers), ferry (0.5 percent), and express bus (9 percent). However, the use of traditional modes such as privately owned and rental cars remains the most widely selected access mode (54 percent by auto, 19.5 percent by taxi, 7 percent by limo). Massport and the Massachusetts Bay Transportation Authority (MBTA) have identified several improvements to the existing system. Worcester is currently not served by the Worcester Regional Transit Authority (WRTA).

Logan's ability to accommodate additional growth, both airside and landside, remains the main aviation issue in Massachusetts today:⁵

^{5/} Massachusetts Port Authority, *Massport Response to SAR*, 1993, p. 9.

"Whatever the longer term demand for Logan Airport may be, there can be no doubt that Logan is currently one of the most congested and delay-prone airport's [sic] in the nation. For at least the past three years, Boston-Logan has ranked among the top 10 most delay-prone airports in the nation."

While there is some disagreement over the exact levels of future demand for Logan, this may be a moot point. Logan is near capacity today; any growth in operations without improvements will merely increase delays and associated costs to all airport users.

Improvements in landside capacity (i.e., ground access) are currently being implemented at an aggressive schedule, primarily through the Logan Airport Modernization Plan (LAMP) and Third Harbor Tunnel projects. Improvements are being provided for a wide variety of ground access modes, including automobiles, buses, subway, etc. For example, a head-of-the-queue metering system will provide preferred access to the Third Harbor Tunnel for High Occupancy Vehicles (HOVs); South Station will be developed as a remote ticketing/baggage center with direct HOV access to the tunnel; engineering designs allow for a future rail connection to the Logan terminals; and efforts continue to expand express bus service from the suburbs.

Planning for enhanced airside capacity is based on two approaches: (1) improvements at Logan; and (2) provision of additional capacity at other locations in Massachusetts. While at least three airports outside Massachusetts (i.e., Manchester, Pease and Providence) have potential to capture demand currently using Logan, no coordinated planning effort exists to consider non-Massachusetts airport assets to enhance overall capacity.

As part of a nationwide program conducted in conjunction with local capacity task forces, the FAA published a Capacity Enhancement Plan for Logan in October 1992. Some of the described recommendations have been or are being implemented, while others await further study. A summary of the study's recommendations is provided below:⁶

"The addition of a new commuter runway or the extension of the short Runway 15L/33R give promise of the greatest relief from delays. Next in significance are the wake vortex advisory and avoidance systems, followed by the possibility of simultaneous approaches to the Runways 4R and 4L and 22R and 22L in [degraded] weather conditions."

Massport has indicated that it is willing to commence planning studies for a new commuter runway, as well as the development of taxiway improvements. These improvements have the potential to reduce delay and ground-level emissions.

While there appears to be significant movement in the area of reducing delays at Logan, efforts to add capacity elsewhere in the region have moved at a much slower pace. In August 1991, a second major airport (SMA) siting study was completed on behalf of the Massachusetts Aeronautics Commission. The study identified and evaluated sites within

6/ Department of Transportation, Federal Aviation Administration, *Boston Logan Capacity Enhancement Plan*, October 1992, p. 45.

the State which could accommodate a major air carrier facility. The two highest ranking sites are both located at Fort Devens, which is scheduled for closure. However, following completion of the SMA study, concerns were raised regarding the need for a new airport. The Strategic Assessment Report (SAR) was initiated in order to investigate the impact of alternatives to the construction of a second major airport and to develop a range of scenarios combining capacity enhancing components.

The SAR study was completed in July 1993. However, it is primarily a tool for future decision making. The study itself does not recommend a preferred development alternative. The most significant outputs of the study were its reevaluation of demand and the development of scenarios which combined aviation and non-aviation facilities. The demand analysis conducted in the SAR study indicates that previous forecasts may have been overly aggressive. The SAR study results are generally lower than previous forecasts, but still indicate that there is a need for system improvements in order to avoid increased delays at Logan. The SAR study considered improvements such as high speed ground transportation (rail/maglev), construction of vertiports, introduction of passenger services at outlying airports, airport improvements at Logan, and the construction of a second major airport.

All scenarios included the Amtrak upgrade of the shoreline rail route from Boston to New York currently beginning, and also included the effects of improvements in telecommunications on business travel demand. Regardless of the type of additional facility elements added, the airport improvements at Logan would be required. While the SAR study does not rank the facility options, the two which resulted in greatest potential delay reduction at Logan were high speed ground transportation and the "second major airport," which the study had evolved into a smaller Large Regional Reliever Airport (LRRRA) concept. The SAR found that the demand would not require a true second major airport, and that the demand could be satisfied by a facility of the physical scale of the existing regional airports such as Manchester, Providence, Worcester, etc., but operating at a higher service level – a LRRRA.

In its consideration of expanded services at airports other than Logan, the SAR study concentrated on "air bases," that is Naval Air Station (NAS) South Weymouth, Hanscom Field, and Pease International Tradeport. However, responses to the SAR study by Massport, the Worcester Municipal Research Bureau (an independent research organization), the Coalition for an Integrated Transportation Plan (CITPlan), and others, has placed a renewed interest on developing Worcester as a regional airport to off-load demand from Logan. Worcester airport experienced approximately 100,000 annual enplanements in FY 1991. As such it is the State's third busiest airport as its annual enplanements were slightly lower than Nantucket. However, Nantucket and the other Cape Cod and Islands airports primarily serve a seasonal niche market and do not have the potential to expand into larger regional facilities. Furthermore, during most of the 1980s, Worcester experienced strong growth, while the other commuter airports in the State grew slowly or not at all.

While Worcester is currently undergoing improvements, focused on the construction of a new passenger terminal (recently opened), air service has declined since 1989. The principal limitations on Worcester have been identified by the Worcester Municipal

Research Bureau as: unreliability of scheduled flights due to weather conditions, lack of flights, higher fares compared to other airports, lack of public information, difficult ground access, lack of covered parking, and noise impact.⁷ These problems are exacerbated by the airport's financial record. While the constraints on the airport are formidable, potential solutions have been identified. The consideration of an expanded role for Worcester and funding opportunities for improvements warrant further study.

4.3.4 New Hampshire

The State of New Hampshire Department of Transportation (NHDOT) only operates a single airport, Skyhaven Airport in Rochester, a general aviation facility with no scheduled air service. The airport facility at Pease International Tradeport is operated cooperatively by the Pease Development Authority, an independent State authority, and the New Hampshire Air National Guard. Both Manchester and Pease are currently designated participants in the Military Airport Program (MAP).

The State's largest airport and principal air carrier service facility is Manchester Airport, which is owned and operated by the City of Manchester. The airport accounted for approximately 2.5 percent of the region's enplanements in FY 1991. Markets served non-stop from Manchester include Boston, Chicago, New York, Philadelphia, and Washington, D.C. The airport also provides intrastate service to Lebanon and Pease, although these routes are primarily served by positioning flights as the distances involved are too short to support feasible service. The NHDOT survey response indicates that there is no demand for additional services for destinations within New England. Rapid growth at Manchester Airport during the 1980s highlighted the airport's potential to capture passengers from most of New Hampshire as well as portions of Massachusetts. The growth in traffic is partially due to convenient ground access, based on the densely populated north-south corridor along I-93. As a result of groundside capacity constraints, a new passenger terminal, parking area, air carrier apron, and taxiways have been constructed at the Airport.

Scheduled service at Pease was initiated in March 1993, with a second airline beginning operations in May. Key markets currently served non-stop include Boston, New York, (Newark and LaGuardia) and Portland. Service to Washington, D.C. (Dulles) was initiated in February 1994. The survey response received from the Pease Development Authority identifies Bradley and Hyannis (seasonal service) as potential destinations within New England which could be served from Pease. Activity statistics collected to date indicate that enplanements may reach approximately 40,000 for the first year of operations. However, the Pease Comprehensive Development Plan indicates that the airport has the potential of growing to a facility similar to Portland International Jetport, with a long-term unconstrained demand projection of one to two million annual enplanements. Due to the infrastructure available at Pease and its geographic location, it is considered to have the potential to become a major air carrier access point for the Seacoast region of New

⁷/ Worcester Municipal Research Bureau, Inc., *The Future of Worcester Airport*, May 6, 1993, pp. 10-13

Hampshire, as well as southern Maine and the Massachusetts North Shore area. The survey response obtained from the Pease Development Authority indicates that continued growth is expected in all segments of air transportation – clearly indicating that the facility is still maturing.

Other airports in New Hampshire with some level of scheduled service include Lebanon and Keene. Lebanon features approximately 40,000 annual enplanements, with non-stop commuter service to Boston and New York. Keene has experienced very low levels of enplanements with federally subsidized service to Boston, New York, and Rutland, Vermont. Scheduled service was halted in 1993 and has recently reemerged, continuing a pattern that makes the likelihood of continued scheduled air service at Keen questionable.

New Hampshire's new State Airport System Plan was completed in January 1992, with the final report published in 1993. The focus of the plan however, is on the State's general aviation airports. Also, the full impact of the redevelopment of Pease was not considered in the SASP, nor are any facility improvements for this airport discussed. However, Pease is identified for inclusion as a new system airport, with a recommended designation as primary air carrier airport. The other two primary air carrier airports are identified as Manchester and Lebanon.

Facility requirements listed for Manchester in the SASP include expanded passenger terminal, car parking, apron, aircraft hangars, and aviation refueling facilities, as well as runway and taxiway extensions. The SASP also considers the role of the NHDOT Division of Aeronautics, and recommends that additional resources be provided to this agency to adequately support the areas of airport development, continuous planning, air service marketing, noise mitigation, economic benefit analyses, and education. It is noted that the Division of Aeronautics staff consists of less than one half of a percent of the total NHDOT labor force.

The SASP identifies improvements for the facilities categorized as system airports, except for Pease. Total investments of \$116 million are identified, of which \$65 million would be for Manchester Airport. Facility needs listed for Manchester include terminal expansion, car parking, apron, hangars, additional fueling facilities, and runway and taxiway extensions.

The New Hampshire 21st Century Transportation Task Force published a study in January 1993 to provide transportation goals for the next century. One of the study's recommendations is that the State's commercial air service facilities be improved and that Pease receive sufficient support to achieve successful redevelopment. According to the study, the construction of new airports is not feasible due to environmental and local constraints. The study also notes concerns about ground access to airports in New Hampshire, particularly Manchester Airport. Recommendations for improvements include increased flexibility in funding of airport improvement projects, the implementation of a long-term management assistance program for general aviation airports, and support for airports experiencing pressure from non-aviation development. The study also urges support for the redevelopment of Pease, but does not include any specific recommendations.

The State's long-range transportation plan for 1994-2003 includes a reference to the 21st Century Transportation Task Force study, but does not include any specific issues related to air transportation. The definition of the National Highway System (NHS) as depicted in the plan shows the proposed Manchester Airport Access Road. This would be a relatively significant improvement in access to Manchester Airport from the south (i.e., southern New Hampshire and portions of Massachusetts).

4.3.5 Rhode Island

Rhode Island differs from the rest of New England in that all of its public airports are State owned. This includes T.F. Green State Airport in Warwick near Providence, which in FY 1991 was the region's fourth busiest airport in terms of enplanements. With over one million annual enplanements, Providence accounted for 6.5 percent of New England's annual enplanements in FY 1991. While formerly managed directly by the Rhode Island Department of Transportation (RIDOT), the State's airports are now operated by the recently formed Rhode Island Airport Corporation (RIAC), a subsidiary of the Rhode Island Port Authority.

[At the time of writing, surveys mailed out to RIAC had not been received.]

Key non-stop destinations served from Providence include Albany, Baltimore, Boston, Charlotte, Chicago, Detroit, New York, Philadelphia, Pittsburgh, and Washington, D.C. Other airports in the State with limited scheduled service (i.e., commuter activity) include Block Island and Westerly. Their traffic is primarily intrastate service to Block Island through other points including East Hampton, N.Y., Fishers Island, N.Y., and Groton-New London.

The most recent Rhode Island SASP was completed in March 1984. The plan identifies T.F. Green as the State's primary air carrier airport, and identified a need for capacity improvements. However, due to the date of the plan, the specific recommendations are too outdated for use in this study.

The State's long-term ground transportation plan briefly addresses intermodal connections to Providence Airport. Rhode Island Public Transit Authority (RIPTA) provides public transportation to the airport with half-hourly and hourly frequencies on weekdays. A marketing study completed in 1989 found that less than one percent of departing passengers use the RIPTA service. A feasibility study showed that high-occupancy vehicle service to the Airport would not generate more than nine passengers per trip in any scenario. However, the plan recommends that RIPTA's service to the Airport be promoted and that a rail-airport connection be considered for the future. The state recently broke ground on a major improvement to the ground-side facilities at T.F. Green.

4.3.6 Vermont

Most of Vermont's public airports are State airports, operated under the auspices of the Vermont Agency of Transportation (VAOT) Division of Rail, Air and Public Transportation. The State's only air carrier airport, however, Burlington International Airport, is operated by an airport commission of the City of Burlington (Burlington Airport Commission). Burlington experienced approximately 400,000 annual enplanements in FY 1991, or 2.5 percent of the region's total demand. Rutland State Airport has featured limited scheduled service to Boston and New York via Keene, N.H. This route is federally subsidized under the Essential Air Service program, but the service has been intermittent. The potential and future ownership of this facility is presently under evaluation.

An air transportation study was completed for the VAOT in November 1990. The study prepared an inventory of existing air service patterns as well as a plan for future air service for the State. The historical trend of consolidation of statewide demand into fewer carriers and fewer airports was noted. This ultimately led to Burlington International Airport's emergence as the only facility with scheduled service by 1989. [The results from a passenger survey indicated the origin of demand includes the City of Burlington and its environs, other Vermont communities, upper New York State, and Canada. Destinations served by Burlington include New York, Washington D.C., Boston, Chicago, Philadelphia and Florida.] Overall, the service pattern was found to be adequate, with little immediate potential for new routes. Hence, the study recommended that the VAOT and Burlington Airport Commission continue to support Burlington as the State's primary commercial service airport.

Vermont's short-term capital improvement plan for FY 1994 includes airport improvement projects, including those for Burlington International Airport. The total project cost for the FY 1992-1998 period for the airport is approximately \$6 million. Key projects include land acquisition, runway reconstruction, taxiway design, pavement management, security, and access roads.

A policy plan completed by VAOT in 1992 was prepared to identify long-term goals for the State's transportation system. The plan recognizes Burlington International Airport as Vermont's only primary commercial air service airport. No specific recommendations are made regarding air transportation policy, but the main general policy is to preserve and improve existing facilities.

■ 4.4 Planned Facilities

Changes in the regional air transportation system occur at several levels, ranging from facility improvements at specific airports to regulatory changes of national scope. The current planning process has resulted in an environment where the planning of infrastructure (i.e., physical) changes varies from state to state. In Rhode Island, Connecticut, and Vermont, much of the planning occurs at the State level. In the other

New England states, it occurs mostly at the airport level, with State aviation organizations serving supervisory and coordinating roles. Projects which receive federal funds also require the involvement of the FAA New England Region. However, the FAA's activity does not constitute a centralized planning function for New England, but provides reviews, approvals, and coordination with State and national programs.

Regulatory changes, on the other hand, are initiated primarily at the national level. This is largely due to the federal government's interest in maintaining control over the safety and efficiency of the national air transportation system. The ability of local communities or individual states to regulate aviation is strictly limited, but nonetheless significant, especially in the area of land use controls. The following sections identify both physical and regulatory changes thought to be of regional significance to air transportation.

4.4.1 Physical

Physical changes are planned at the airport or state level, mostly in the form of airport improvements, as well as at the regional level (e.g., updated air traffic control technology). At the same time, the aircraft fleet mix serving New England is constantly evolving as airlines introduce more modern, fuel efficient, and quieter aircraft. Key physical changes in each of these areas are summarized below.

Airports

As airports have developed into centers of economic activity, development around airport boundaries has increased. Now, most, if not all, of the New England airports considered here are severely limited in their ability to expand beyond current property lines. The construction of new runways remains unlikely at most airports, with the possible exception of a short commuter runway at Logan. For similar reasons, runway extensions are unlikely to be accomplished; only Manchester Airport is actively exploring this possibility.

The construction of a new airport remains one option to increase system capacity. The Second Major Airport Siting Study prepared for the Massachusetts Aeronautics Commission explored this option, and identified the most suitable sites. However, as discussed previously, the need for a second airport was revisited in the Strategic Assessment Report study. At the time of writing no decision had been made regarding the future of a new facility in the region. It must be assumed that Logan will continue to remain the largest provider of air transportation services to the region for the immediate future, and that air travel demand at Logan will continue to grow until changes in capacity and/or demand occur.

Given the difficulties in expanding airside capacity through the addition and extension of runways, other measures are being planned. These include new or modified taxiways, improvement to instrument approach systems or navigation aids, improved air traffic control procedures, and new air traffic control technology. Increasingly however, airports are focusing on landside improvements, particularly in the areas of terminal building upgrades (i.e., new facilities or modifications to existing ones) and ground access improvements. The latter are primarily in the form of new connector roads to the interstate

highway system or improvements to local access roads. However, Logan is currently planning substantive changes involving alternate transportation modes and rail connections are being considered at some of the regional airports (i.e., Bradley and Providence).

Table 4.5 summarizes key projects at individual airports. When known, projected completion dates are listed.

Airspace and Air Traffic Control

The federal government is currently undertaking an ambitious upgrade of air traffic control and weather systems across the nation, which will ultimately impact all air traffic control facilities in New England. Advanced technologies are being introduced in the areas of surveillance radar, weather detection and reporting, digital data-link, and air traffic control automation. Two of the most significant programs are the Advanced Automation System (AAS) and the development of satellite-based navigation procedures. AAS represents a new system to be used by air traffic controllers in the United States. It is associated with a series of automation components, which are expected to reduce delays and increase safety in both the en route and terminal environments. It will ultimately result in organizational changes as well, which may result in some consolidation of New England radar facilities.

The introduction of satellite-based navigation systems (e.g., Global Positioning System – GPS) has several potential applications at New England's airports. Projects include the use of GPS for new instrument approaches, surface movement detection, and innovative flight procedures. GPS achieved initial operational capability (IDC) on December 9, 1993.⁸ However, several issues regarding technical feasibility, procedures, and funding need to be resolved prior to full-scale use of satellite-based navigation technology. If these issues are successfully resolved, introduction of this technology is expected to occur in the 1995-2000 period.

Aircraft and Airlines

The average size of both air carrier and commuter aircraft is projected to increase in the next two decades. If demand for air travel continues to increase at a more rapid rate than increases in airport capacity, airlines will benefit from providing more seats per operation. In fact, average aircraft size has been increasing for much of the last decade. However, following the recent downturn in the airline industry, airlines have become much more cautious in their fleet planning. As a result, regional airports such as Burlington International have seen a replacement of some of their jet aircraft by smaller, more efficient turboprop commuter aircraft. Future fleet changes will be closely tied to the financial status of the airline industry and aircraft sizes are more likely to be tailored to the profitability of specific routes. Nonetheless, over the long term, average aircraft size will increase as exemplified by the introduction of larger air carrier aircraft (e.g., Boeing 777 for international service) and commuter aircraft (e.g., Saab 2000). Other aircraft technology improvements are focused on the areas of avionics, cockpit automation, noise reduction (internal and external), and passenger comfort and entertainment systems.

8/ Filter Center, Aviation Week and Space Technology, January 10, 1994, p. 67.

The airline industry itself is still feeling the effects of deregulation and economic hardship of the early 1990s. Despite nearly continuous growth in traffic, the airline industry experienced a 1993 loss estimated at \$1.3 to \$1.5 billion. Over the last four years, the industry has reported a total of \$11 billion in losses.⁹ This has resulted in some consolidation in the industry, including the liquidation of Eastern and Pan American, but bankruptcy provisions have allowed other airlines to operate despite heavy losses. While the "big three" airlines (United, Delta, and American) are generally considered to be in good financial health, the future of the other airlines is less certain. Another more recent development is the emergence of new start-up airlines based on the success of Southwest Airlines. These airlines are typically non-unionized, have low levels of overhead costs, provide low fare alternatives, and serve specific city-pair combinations instead of relying on hub-and-spoke systems.

Both the legislative and executive branches of the federal government have recently increased their attention on the airline industry. This is due to a combination of issues, including the financial status of the major U.S. airlines, consumer complaints regarding delays and service, and increased foreign investments in U.S. carriers. While it is impossible to predict the impact of these issues on aviation in New England, the effect of airline issues on regional air traffic was highlighted by the strike and subsequent cessation of activity at Eastern Airlines. The ability of New England States to exercise control over these issues, including the setting of fare levels, is limited under the current regulatory environment.

The domestic production of new general aviation aircraft reached an all-time low in 1993, and other indicators of general aviation activity describe a continued downturn. Issues facing the general aviation industry include rising aircraft operations costs, liability insurance costs, land development pressures, and lack of funding for general aviation airports and support systems. Recent developments such as simplified certification rules for light aircraft, satellite-based navigation, low cost avionics, and transfer of technology from experimental to certified aircraft should provide some relief for this sector of the air transportation industry. However, for the immediate future business and recreational general aviation activity is expected to remain in a state of decline, at least until strong economic recovery is achieved.

4.4.2 Regulatory

The largest regulatory issue currently facing New England airports is the future of the Airport Improvement Program. Federal funds from the AIP are critical to both general aviation airports and air carrier airports. Improvements involving AIP funds typically feature 90 percent federal participation. AIP reauthorization for FY 1994 is not likely to be achieved until mid-1994, nearly halfway into the federal fiscal year. Even then, the duration and funding level of the upcoming AIP reauthorization remains unclear. Authorized levels proposed for FY 1994 are lower than FY 1993. The long-term future of

^{9/} U.S. Airline Losses in 1993 May Total \$1.5 Billion, Airports, January 4, 1994, p. 4.

the AIP is also in question, even though the program relies entirely on aviation fuel and ticket taxes. The Office of Management and Budget has proposed to reduce the program's funding level by \$570 million for FY 1995 and instead provide a loan program for primary airports. The loans would be for 15-year terms at a 3 percent interest rate.¹⁰ While some airports with scheduled service will be able to complete airport improvements using monies collected from Passenger Facility Charges (PFCs), smaller airports will find it very difficult to fund projects without the AIP program or similar assistance. Survey responses from state aviation organizations indicate that the future of the AIP program, as well as regional coordination of AIP projects, is a top concern.

The Essential Air Service (EAS) program provides federal subsidies for scheduled services to smaller communities. This is another program currently under scrutiny by the federal government. FAA funding reauthorization for FY 1994 scaled back the EAS program, with minor implications for airports in New England. Elimination of the EAS program has been identified as a potential means to reduce the budget deficit, however, and further cuts are expected.

The administration of the AIP program is another area likely to change, partly due to reductions in the FAA budget. FAA's operations and maintenance (O&M) budget is being reduced by 10 percent. Total staff is being reduced by 4 percent in FY 1994 and 4 to 6 percent in FY 1995. One of the recommendations currently being considered is a decreased involvement in general aviation airport projects. Instead of administering individual AIP grants to airport sponsors, FAA would increasingly rely on block grants provided to the states, to be managed by the state aviation organizations. Such a program would provide increased control at the state level, which could facilitate the implementation of a region-wide cooperative program. However, some state aviation organizations would most likely require increased staffing levels in order to support such a program. A shift to state block grants would not necessarily result in overall reduction of workload, but more a shift in responsibilities from the federal to the state level.

While not strictly a regulatory issue, Massport's proposed peak hour pricing program for Logan has been identified as an issue of concern by several state aviation organizations. In particular, the northern New England states (i.e. New Hampshire, Maine, and Vermont) view Logan as a critical access point to the national and international air transportation networks. The proposed program is based on increased charges for aircraft operating during peak hours at Logan. The intent is to reduce aircraft delay by reducing the number of aircraft accessing Logan during periods of peak activity. However, the program is expected to primarily affect commuter airlines, which are less able to absorb increased charges due to the lower number of passengers per commuter flight. This is of concern to the northern New England states since much of their air service is in the form of commuter flights to Logan. In 1992, commuter flights accounted for 43 percent of all operations but only nine percent of annual enplanements at Logan. This highlights the significant role of commuter operations on delays at Logan. A successful resolution of this issue should be considered as one of the goals of the NETI program.

¹⁰/ *Industry News*, Airports Consultants Council News, December 1993, p. 9.

■ 4.5 Implications for Next NETI Tasks

Examination of New England's air carrier and commuter airports illustrates that air service demand is unaffected by state borders. For example, Bradley serves Connecticut and Massachusetts, Portland and Pease both serve Maine and New Hampshire, Burlington draws traffic from New York and Canada, etc. Moreover, with the exception of Boston, the key destinations of New England airports are outside of the region – New York, Washington, D.C., Chicago, Florida, as well as the nation's major air carrier hubs and destinations beyond. In some cases there is potential for an overlap of airport service, for example Pease and Portland, Worcester and Logan, etc. The survey responses indicate that in general there is little perceived demand for additional services within New England, however, access by commuter airlines into Logan remains a concern.

On the other hand, the planning of airport facilities and ground access services to airports occurs primarily on a state-by-state level. The level of state involvement varies greatly across the region: Connecticut and Vermont have considerable levels of state operation of airports; Maine, Massachusetts, New Hampshire, and Rhode Island less so, although independent state authorities (i.e., Massport, PDA and RIAC) play key roles. It is possible that a more coordinated planning effort could result in a more efficient allocation of scarce resources (both financial and organizational). Several survey responses indicated a desire for additional coordination. Suggested areas of coordination include coordination of capital projects within the AIP, regional access to Logan (and related capacity issues), the development of a regional airport system, and accommodating general aviation. The issue of coordinated planning requires additional study as possible drawbacks exist. For example, while the existing system of state-centered planning often results in direct competition between airports, this may not always be negative.

The difference in state involvement in aviation issues is evident in the examination of individual states' transportation plans. Overall, aviation appears to play a relatively small role in state transportation plans compared to surface transportation modes. Despite the number of passengers carried by air carrier and commuter airlines (17 million in FY 1991), aviation receives relatively little attention. This is partly because traditional transportation planning focuses on individual modes. Until ISTEA, statewide transportation plans were for all practical purposes highway plans. However, while ISTEA has introduced a need to think in terms of alternative modes and the connection of modes, current planning still treats aviation independently of surface transportation. The possibility of a more coordinated transportation planning methodology should be considered.

Logan's role in the region will remain substantial throughout the foreseeable future. Logan captured nearly two-thirds of regional enplanements in FY 1991 and serves as an important connecting point for the rest of the region's commercial air service airports. The extent to which Logan will continue to serve as a regional collector point needs to be investigated further. The Strategic Assessment Report indicates a continued reliance on Logan to access national and international destinations, whereas Massport demand studies indicated a decline in the ratio of connecting passengers. As shown by the survey responses, several of the New England states (particularly the northern tier) perceive Logan to be a vital

economic link. This demonstrates a need for cooperative planning, for example in areas such as demand/capacity issues.

Attempts to control aviation demand have generally proven either to be infeasible or cost ineffective. It appears instead that the focus should be on capacity, both at individual facilities and in the region as a whole. However, what is commonly discussed as aviation demand is more fundamentally high speed transportation demand and aviation capacity needs to be related to new plans and proposals for high speed ground transportation. Provision of new or expanded capacity is going to be a challenging task due to environmental and local concerns. The most pressing need in the region is capacity enhancement in Massachusetts, whether through expanding an existing facility, construction of a new airport, or other means. This need is not limited to Massachusetts – it affects the capacity of all of New England. The level of cooperation in the planning and funding of such improvements needs to be defined.

Ground access to airports is likely to become an increased concern as environmental and landside capacity issues receive more attention. Currently, the use of automobiles (private, rental, taxi, etc.) to access airports is unusually high. The use of automobiles (i.e., taxi, limo, rental car, or private car) to access airports is unusually high. The survey responses indicate that at the regional airports, automobiles constitutes nearly the only access mode used (95 percent of passengers at Bangor, 99 percent at Burlington, and 98 percent at Pease). This partly reflects overall transportation trends and partly airport specific issues such as number of connections and the need for timely arrival for flights. Hence, planning in this area must use a two-fold approach: (1) airports need to be included in the general consideration of surface transportation improvements, including planning for public transit and rail; and (2) airport specific improvements need to be investigated. Except at Logan, there may be little interest among airport sponsors to provide alternative modes of transportation given funding constraints. At the regional airports, the primary interest is in expanded bus and van service. Secondary interests include interstate rail (e.g., Pease) and bicycle/pedestrian access (e.g., Pease and Portland).

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Tables

Table 4.1 New England Airports Ranked by Annual Enplanements

Rank	Airport	State	Enpl. (FY91)	Share	Cumulative Share	NPIAS Role
1	Logan	MA	10,339,000	61.0%	61.0%	Primary: Long Haul
2	Bradley	CT	2,232,000	13.2%	74.2%	Primary: Long Haul
3	Bangor	ME	1,149,000	6.8%	80.9%	Primary: Long Haul
4	Providence/Warwick	RI	1,108,000	6.5%	87.5%	Primary: Medium Haul
5	Portland	ME	551,000	3.3%	90.7%	Primary: Short Haul
6	Manchester	NH	405,000	2.4%	93.1%	Primary: Medium Haul
7	Burlington	VT	402,000	2.4%	95.5%	Primary: Short Haul
8	Nantucket	MA	119,000	0.7%	96.2%	Primary: Short Haul
9	Worcester	MA	114,000	0.7%	96.9%	Primary: Short Haul
10	Hyannis	MA	107,000	0.6%	97.5%	Primary: Short Haul
11	New Haven	CT	100,000	0.6%	98.1%	Primary: Short Haul
12	Bridgeport	CT	62,000	0.4%	98.4%	Primary: Short Haul
13	Pease	NH	44,000*	0.3%	98.7%	New
14	Presque Isle	ME	37,000	0.2%	98.9%	Primary: Short Haul
15	Lebanon	NH	37,000	0.2%	99.1%	Primary: Short Haul
16	Martha's Vineyard	MA	27,000	0.2%	99.3%	Primary: Short Haul
17	Westerly	RI	27,000	0.2%	99.5%	Primary: Short Haul
18	Groton-New London	CT	27,000	0.2%	99.6%	Primary: Short Haul
19	Block Island	RI	26,000	0.2%	99.8%	Primary: Short Haul
20	New Bedford	MA	18,000	0.1%	99.9%	Primary: Short Haul
21	Augusta	ME	9,000	0.1%	99.9%	Primary: Short Haul
22	Provincetown	MA	6,000	<0.1%	100.0%	Other: Short Haul
23	Bar Harbor	ME	5,000	<0.1%	100.0%	Other: Short Haul
Total			16,951,000			

* Pease International Tradeport had no scheduled enplanements in FY 1991. The value shown represents an estimate for calendar year 1993, the first year that Pease experienced any civilian enplanements.

Source: Federal Aviation Administration, Terminal Area Forecasts: FY 1993-2005, July 1993.

Table 4.2 Airports Selected for Individual Consideration

State	Formal Airport Name	ID	City	County
CT	Bradley International	BDL	Windsor Locks	Hartford
MA	Logan International	BOS	Boston	Suffolk
MA	Worcester Municipal	ORH	Worcester	Worcester
ME	Bangor International	BGR	Bangor	Penobscot
ME	Portland International Jetport	PWM	Portland	Cumberland
NH	Manchester	MHT	Manchester	Hillsborough
NH	Pease International Tradeport	PSM	Portsmouth	Rockingham
RI	T.F. Green State	PVD	Warwick	Providence
VT	Burlington International	BTB	Burlington	Chittenden

Source: Hoyle, Tanner & Associates, Inc.

Table 4.3 Contacts for Interviews and Surveys

Organization	Airport Operators	City	State
Airport Operators			
Tweed-New Haven	City of New Haven, Department of Aviation	New Haven	CT
Bradley International	Connecticut Department of Transportation	Windsor Locks	CT
Contacts for Interviews and Surveys			
Massachusetts Port Authority	Massachusetts Port Authority	Boston	MA
Worcester Municipal	City of Worcester, Department of Aviation		MA
Bangor International	City of Bangor, Department of Aviation		ME
Portland International Jetport	City of Portland		ME
Manchester Airport Authority	City of Manchester, Department of Aviation		NH
Pease Development Authority	Pease Development Authority	Portsmouth	NH
Rhode Island Airport Corporation	Rhode Island Airport Corp.	Providence	RI
Burlington Airport Commission	City of Burlington, Burlington Airport Commission		VT
State Aviation Organizations			
Massachusetts Aeronautics Commission		Boston	MA
New Hampshire Department of Transportation			
Division of Aeronautics		Concord	NH
Maine Department of Transportation			
Air Transportation Division		Augusta	ME
Connecticut Department of Transportation		Newington	CT
Bureau of Policy and Planning			
Vermont Agency of Transportation		Montpelier	VT
Division of Rail, Air, & Public Transportation		Providence	RI
Rhode Island Airport Corporation			
Federal Agencies			
Federal Aviation Administration			
New England Region, Airports Division		Burlington	MA

Table 4.3 Contacts for Interviews and Surveys (continued)

Organization	Airport Operators	City	State
Industry Representatives			
Air Transport Association of America		Washington	DC
Aircraft Owners and Pilots Association		Frederick	MD
American Society of Travel Agents		Alexandria	VA
Regional Airlines Association		Washington	DC

Source: Hoyle, Tanner & Associates, Inc.

Table 4.4 New England Airports by State

State	Public	Private	Total
CT	26	102	128
MA	52	121	173
ME	78	69	147
NH	27	41	68
RI	6	15	23
VT	18	43	61
Total	209	391	600

Source: FAA, National Plan of Integrated Airport Systems.

Table 4.5 Planned Airport Improvements

Airport	State	Planned Changes	
		(Years indicate Projected Date of Completion)	
Bradley	CT	Terminal area development Ground access improvements	
Logan	MA	Passenger remote parking – Woburn	by 1995
		Passenger remote terminal – South Station	by 1995
		Modifications to Terminal E	by 1995
		Third Harbor Tunnel	by 1995
		Modifications to Airport blue line subway station	by 1998
		Replacement of Terminal A	1995-2000
		Federal inspection services facility	1995-2000
		Fuel distribution system	1995-2000
		Airport-edge improvements	1995-2000
		Airside connector tunnel	1995-2000
		Parking consolidation	1995-2000
		Bus maintenance facility	1995-2000
		Contractors' staging area	1995-2000
		Additional employee remote parking	1995-2000
		Consolidated airport maintenance facility	1995-2000
		Southwest service area redevelopment	1995-2000
		Consolidated rental car facility	1995-2000
		North service area development	1995-2000
		Terminal E west concourse	2000-2010
		Terminal A expansion	2000-2010
		People-mover system to Terminals B, C, and subway	2000-2010
		Passenger remote terminal west suburban	2000-2010
		Governor's Island development	2000-2010
		Hangar No. 32 replacement	2000-2010
		Construction of short undirectional commuter runway and taxiway improvements are under consideration.	
Worcester	MA	Automated weather observing system	1994
		New control tower	
Bangor	ME	Pavement upgrades and management programs	
Portland	ME	Airport master plan update	
		Terminal area expansion	
		Cargo facility development	
		Ground access improvements	
Manchester	NH	Airport master plan update	1994-1995
		Access road connecting south part of airport to north-south highways (I-93 and Everett Turnpike)	
		Runway extension or upgrade to crosswind runway is under consideration.	

Table 4.5 Planned Airport Improvements (continued)

Airport	State	Planned Changes	
		(Years indicate Projected Date of Completion)	
Pease	NH	Noise and impact compatibility study	1994
		Airport master plan	1995
		Ground access improvements to main entry from Spaulding Turnpike	1995
		Environmental clean-up	
		Development of best management practices (stormwater)	
		Deicing equipment improvements (runway and aircraft)	
		Upgrades to instrument approach system (instrument landing)	
		System Runway 16, Category II Instrument Landing System, new approach lights	
		Current terminal building is temporary and is expected to be replaced in the future. Airport layout plan has reserved areas for cargo facility development, but no construction is currently planned.	
Providence	RI	New terminal building (\$168 million, 14 gates)	
		Taxiway improvements	
		Ground access improvements	
Burlington	VT	Land acquisition program	1996
		Pavement upgrades and maintenance	
		Larger, more suitable commuter aircraft apron	
		Parallel taxiway extension	
		Improvements to parking and ground access	
		Terminal relocation	
		Instrument Landing Systems (ILS) runway 33	

Source: HTA

Figures

Figure 4.1 New England Airports – Regional Share of Total Annual Enplanements

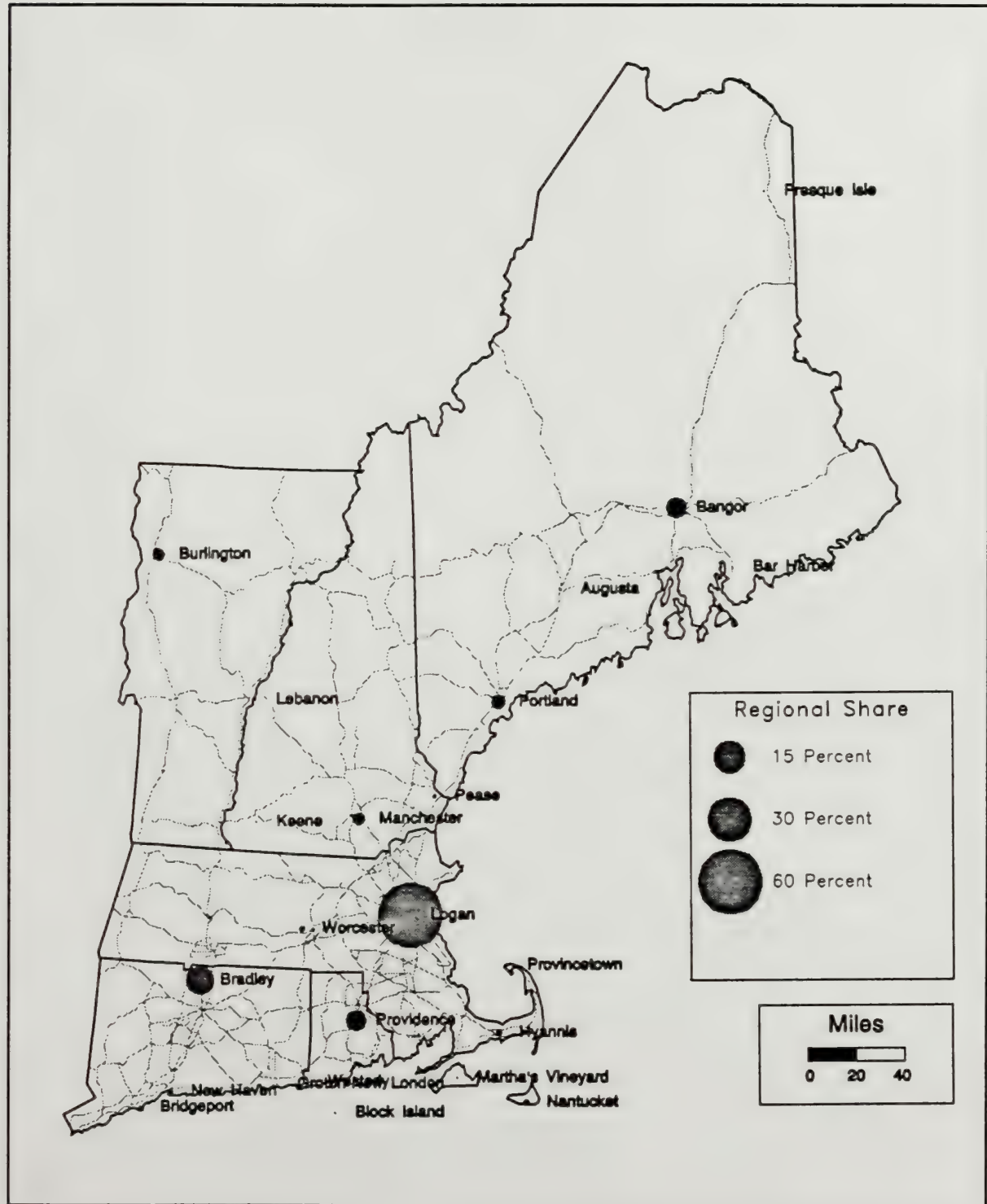
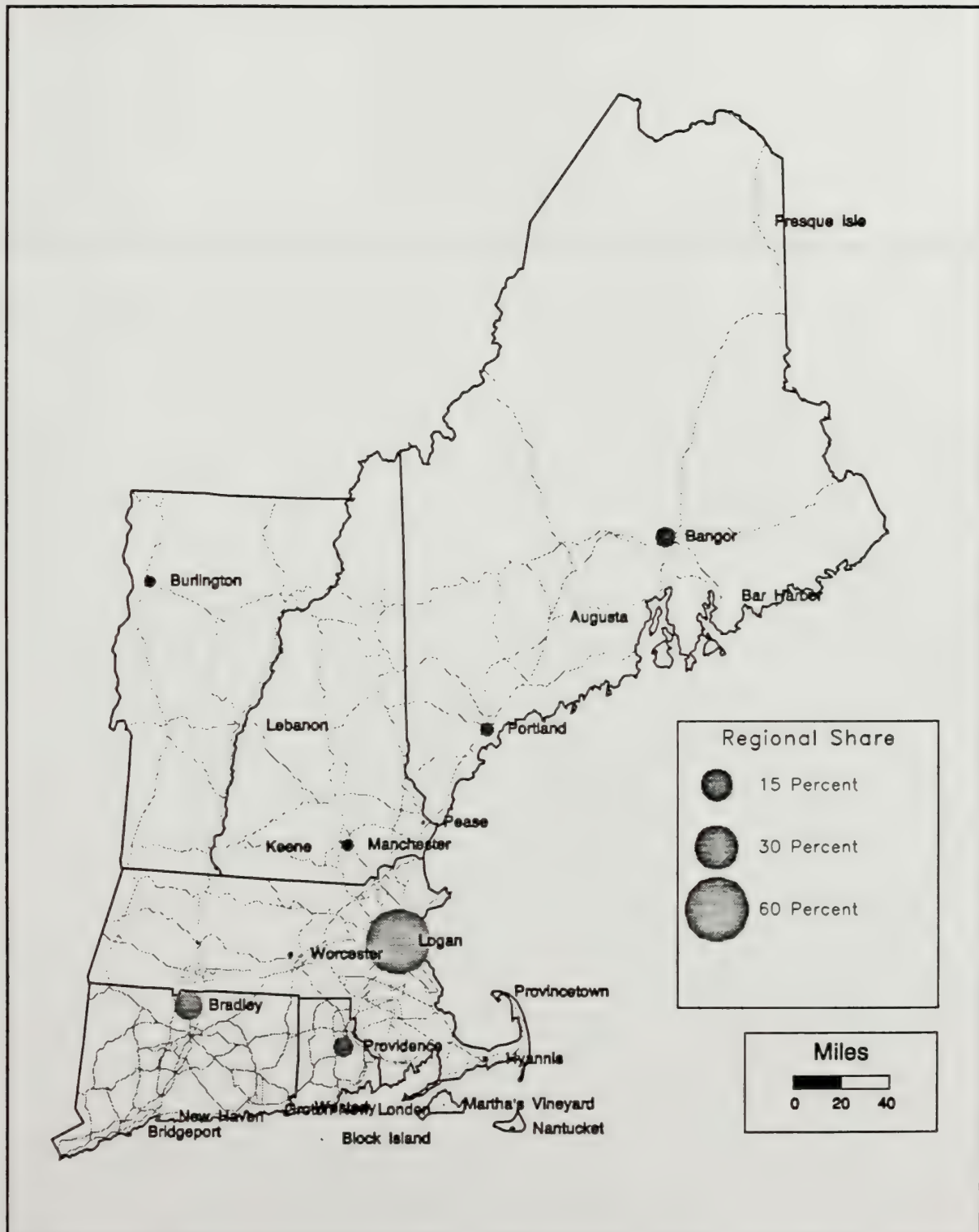


Figure 4.2 New England Airports – Total Annual Enplanements by Location



5.0 *Ports and Pipelines*

Chapter 5.0 – Ports and Pipelines

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5.0 Ports and Pipelines

■ 5.1 Key Issues/Focus

The purpose of this chapter is to document existing and planned port and pipeline facilities of regional significance in New England. It is also intended to provide a general overview of the region's present marine activity, in order to provide a framework for continued analysis in subsequent NETI tasks.

The selection of the "regionally significant" ports was based upon a combination of factors, including:

- Volume of cargo processed;
- Recent and planned investments in physical facilities;
- Planning goals of the individual states; and
- Hinterland market location and size.

A discussion of the selection of the study locations by specific state follows:

Maine

The State of Maine has self-designated three port priority areas: Eastport, Searsport, and Portland. Portland and Searsport are both among the top 150 ports (by total tonnage) in the United States, according to the U.S. Army Corps of Engineers Waterborne Commerce Statistics (WCS) for 1991. Their rankings are 61 and 145, respectively. Eastport ranks well below the top 150 ports, but is the major port serving a very important hinterland – the forest-product producing region of northern Maine. Maine is considered to be an increasingly active participant in the forest product export trade, and a recent study indicates that Eastport is well positioned to significantly expand its port commerce.

New Hampshire

The Port of New Hampshire at Portsmouth is the only significant port in the state, and was ranked at 89 in the 1991 WCS.

Massachusetts

Massachusetts has three ports listed in the 1991 WCS top 150 ports: Boston, Fall River, and Salem (ranked 32, 87, and 123 respectively). Boston and Fall River handle a diverse spectrum of cargo which is traded with a truly regional (and in the case of Boston, national)

market. Salem, however, lacks good inland connections and almost exclusively handles fossil fuels destined for a large harborfront utility company, and for the local home heating oil market. For this reason Salem was not considered to be regionally significant and was not studied further.

The Port of New Bedford, while not ranked in the WCS top 150 by volume, was nevertheless included in the study due to its trade in high value commodities such as seafood and fresh fruit, its handling of dry bulk materials which are not handled at nearby Fall River, and its status as an active passenger port.

Rhode Island

Rhode Island has one port, Providence, which is found in the WCS statistics. Its overall rank is 73.

A second location, at Davisville, was also included in the study due to the state's active promotion of the port and adjacent Quonset Point Naval Air Station as a potential major regional industrial park and international trade center.

Connecticut

Connecticut has four ports listed in the WCS top 150: New London, New Haven, Bridgeport, and Stamford. Their ranks are 138, 60, 92, and 147 respectively. The State actively promotes only New London, New Haven and Bridgeport, which have all had significant amounts of both domestic and international trade.

Stamford's cargo consist almost exclusively of coastal receipts of sand, gravel, and fuel oil, and so it was not included in the study as "regionally significant."

Vermont

Vermont has no ports of regional significance.

■ 5.2 Methodology

The information on existing and proposed facilities was obtained from a combination of federal, state, local and private sources. In general, initial contacts were made with state Departments of Transportation, or other agencies responsible for economic development and/or planning. These officials were able to provide documentation on the individual State's long-term transportation planning as it related to port issues. The State officials were also a good source of information as to what local authority was directly responsible for ownership/operation at each of the individual ports in the state.

Local port authorities were contacted next, and typically provided copies of annual reports, environmental documents or grant applications for proposed projects, maps, trade

handbooks and other promotional material. These documents frequently provided complete information on physical facilities, commodities handled, and cargo volumes.

Federal-level information was obtained in order to fill information gaps which may have existed at the local and state levels. The most useful information consisted of the Army Corps of Engineers Port Series handbooks, which provide very detailed information on physical facilities; and data from the Corp's Waterborne Commerce Statistics Center, which included detailed summaries of commodities handled and tonnages shipped to and from each port.

After reviewing all of the written documentation obtained from the various agencies, a second round of telephone interviews was conducted. The purpose of these interviews was to resolve discrepancies between differing sources, and obtain current status on issues which post-dated the available written information.

A limited amount of contact was also made with private operators of port facilities, when information on significant facilities or issues could not be obtained from public sources. This was especially true with respect to oil and gas pipelines.

■ 5.3 Existing Conditions

This section provides a description of the physical and operating characteristics of each port of regional significance. Table 5.1 provides summary information. The location of the ports and their shares of regional cargo are shown in Figure 5.1. Passenger ferry services are shown in Figure 5.2. Figures 5.3-5.14 show the layout of the ports and surrounding areas.

5.3.1 Port of Eastport, Maine

Overview

Eastport is located on the Bay of Fundy, at the most easterly point in the continental United States. The Port is located on Friar Roads, which has a width of over one mile and separates Eastport from Campobello Island, New Brunswick.

Local Authority

The Eastport Port Authority operates a single pier and support facilities on a lease agreement from the city. Future projects are expected to be owned by the Port Authority.

General and Dry Bulk Cargo Facilities

The port facilities include a breakwater pier located in downtown Eastport which measures 410 feet by 90 feet. There are also in-water dolphins off the pier allowing for berthing of

ships of 700' in length. The depth off of the pier is 40 feet MLW. A 20,000 sf warehouse/transit shed with ingress/egress areas services the pier. In addition to ocean carriers, the pier accommodates (on its inshore face) fishing vessels and recreational craft. There is little or no open staging or storage space in the Port area due to it's downtown location. As a result, much of the outbound cargo, such as woodpulp, must be direct loaded from trucks rather than first being stored and staged, as is typical at most ports. Similarly, the other major outbound cargo, logs, must be stored in various lots scattered throughout the town prior to being loaded onto trucks and ferried to ship side. Both of these practices are very inefficient, and have traffic, safety and aesthetic impacts on the City of Eastport.

Intermodal Connections

The primary vehicular access to the Port of Eastport is via State Route 9 and U.S. Route 1, which are both two-lane highways. The nearest four-lane highway is Interstate 95, approximately 127 miles away in Bangor. Although a branch of the Maine Central system formerly served Eastport, the port presently has no direct rail access or service. The nearest railhead is the Guilford Rail System, 38 miles away in Calais.

Port Activity and Markets

The Port of Eastport handled approximately 213,000 tons of cargo in 1992, mostly (95 percent) consisting of woodpulp and logs for export. The major portion of the wood products originated from Georgia-Pacific's nearby Woodland facility, and a lesser amount consisted of logs from Revelen International. The foreign destination for Eastport's wood exports include Canada, Japan, Great Britain, the Northern European countries, Turkey and Pakistan. The other major cargo handled at Eastport in 1992 consisted of export granite from the Rock of Ages quarry in Barre, Vermont to the Far East.

5.3.2 Port of Searsport, Maine

Overview

The Port of Searsport is located at the head of the Penobscot Bay four miles northeast of Belfast Harbor. The approach channel to the Port is 500 feet wide, and is maintained at a depth of 34 feet MLW. The main cargo handling facilities serving the Port are located at Mack Point, approximately one mile east of the town center. A turning basin 1,500 feet wide is located off of Mack Point, and is also maintained to 34 feet MLW.

Local Authority

The Harbormaster is employed by the Town of Searsport. There is no other official State or Local Government involvement in the day-to-day commercial operations at the Port. The Maine Department of Transportation, through its' Division of Ports and Marine Transportation is involved in promoting activity at all of Maine's ports, and has been actively involved in supporting the establishment of the proposed Sears Island International Cargo Port, at Searsport.

General Cargo Facilities

Cargo handling terminals at Searsport consist of the Bangor and Aroostook Railroad Pier, and the Sprague Energy Pier, which are located adjacent to each other at Mack Point. Both facilities are privately owned and operated, and handle a variety of dry and liquid bulk, and break bulk cargos.

The Bangor and Aroostook Railroad Pier is a 752' x 100' wood decked facility with two berths, one 600' long (34' MLW) on the east side, one 550' long (32' MLW) on the west side. The pier is largely comprised of covered storage area. Four warehouses, covering a total floor area for 37,800 square feet are located at the facility. Three of the warehouses are on the pier itself, and one is located on the pier approach, connected by an enclosed ramp. All warehouses feature a vertical storage height of twelve feet, and are equipped with sprinkler systems. Four tanks are available on-site for discharge of petroleum products, and there is a two- to four-acre lay-down area, generally used for lumber exports.

The Sprague Energy Dock is a 614' x 67' concrete decked facility, with an 850' long berth. Depth off of the pier is 34 feet MLW. The pier features three movable steel discharge towers for handling dry bulk cargo. The towers are 100 feet in height and have clamshell type diggers. Cargo is transported from the towers on a seven belt conveyor system, which discharges directly into open-top railroad cars or trucks. Cargo can also be stored in open or covered storage facilities. The transport system is designed to discharge cargo at a rate of up to 1,000 tons/hour, with the average rate being 700-800 tons/hour. For liquid cargoes, one heated discharge hose for oil providing a discharge rate of 10,000-12,000 bbls/hour, as well as a caustic soda line with a discharge rate of 500 tons/hour are available. Storage facilities include one covered warehouse which holds 8,000 tons of road salt, three oil tanks which hold 340,000 bbls. and one caustics tank with a capacity of 10,000 tons. Twenty-six acres of open storage area are also available. Sprague Energy Dock also has a self-unloading hopper for ships which can unload themselves.

Intermodal Connections

Vehicular access from Searsport to Interstate Highway 95 is available at Hampden (27 miles via U.S. Route 1A) and Augusta (50 miles via State Route 3). Direct rail service is available via the Bangor & Aroostook Railroad (B&A). The B&A has two tracks directly on the B&A pier, and also serves the rear of the Sprague Energy Pier. In addition, a 350-car capacity rail yard is located adjacent to the waterfront facilities.

Port Activities and Markets

Searsport typically handles approximately 50 percent of Maine's dry cargo shipments. In 1990, 424,000 tons of dry cargo were processed, consisting of such commodities as paper, tapioca flour, sulphur, salt, gypsum, bauxite and coal. Liquid bulk products, such as heating oil and chemicals are also an important cargo at Searsport, and approximately 660,000 tons of petroleum products are handled in a typical year. Most traffic at Searsport consists of imports, with the major export commodity consisting of newsprint paper (15,000-20,000 tons per year).

5.3.3 Port of Portland, Maine

Overview

The Port of Portland is located on the Fore River approximately 3.5 miles from open ocean. Its main ship approach channel is 1,100 feet wide with a depth of 45 feet at mean low water. The inner harbor and most piers have a depth of 35 feet at MLW. Portland features a full range of marine facilities and services, including one of the largest ship overhaul and repair yards on the east coast. Portland is also home port for a state-of-the-art oil spill response vessel, due to the large volume of tanker traffic through the Port.

Local Authority

The City of Portland owns and operates three waterfront facilities: a commuter ferry terminal, which serves the nearby islands of Casco Bay, the Portland Fish Exchange, which is the only wholesale fish auction in the U.S., and the International Terminal, which recently rehabilitated its 750' berth and serves as home port for the 470' international ferry, the Scotia Prince. A harbor commission, made up of representatives from the cities of Portland and South Portland, is responsible for handling policy issues affecting the harbor.

Container and General Dry Bulk Facilities

The major dry cargo facility in Portland is the privately owned Merrill Marine Terminal, located at the westerly end of Portland Harbor. The terminal handles bulk and break-bulk cargo, and includes a 600 foot long by 135 foot wide concrete marginal wharf. The wharf has two berths, a 900 foot long general cargo berth with 35 feet MLW and a 450-foot berth which can accommodate roll-on roll-off cargo ships in 25 feet MLW. The Merrill Marine Terminal also features over five acres of open storage space, and 150,000 square feet of covered storage. Mechanical handling equipment includes cranes of up to 175-ton capacity.

Liquid Bulk Cargo Facilities

Approximately seven major liquid bulk cargo facilities operate along the southerly side of the Fore River. All are privately owned, and many of the regions' major oil companies are represented with their own terminals. Typical berth lengths are 600-700 feet, although the Star Enterprise Terminal and Portland Pipe Line Pier have berths of 900 and 1,000 feet, respectively.

Commercial Fishing Facilities

In addition to the Portland Fish Pier and Auction, located on the northerly side of the Fore River, approximately six to nine piers are used for the receipt of seafood and mooring of privately owned fishing vessels. The majority of these piers are located at the foot of Portland's downtown area.

Intermodal Connections

The Port of Portland is located less than one mile from the Interstate highway system, serving all of New England, the east coast, and connecting to Canada. The Merrill Marine Terminal features rail sidings with a capacity of 50 cars, and is directly connected to the

Guilford Rail System, serving northern New England points, and the St. Lawrence and Atlantic Railway, which connects Portland with Canada.

Port Activity and Markets

The Port of Portland handled approximately 12.7 million tons of cargo in 1992. Of this total, 12.2 million tons consisted of liquid bulk materials, mostly petroleum products. Dry bulk and break-bulk cargo volume was 500,000 tons, and included materials such as forest products, scrap metal, coal, salt, and fertilizer. Portland also offers the only direct containerized cargo service in New England north of Boston, and containers comprised approximately 26,000 tons of the 1992 total. Portland's trading partners include northern European countries, Canada, Asia and the Middle East.

Cruise vessels and passenger ferries also serve the Port, including Prince of Fundy Cruises' Scotia Prince, which offers overnight passenger and vehicular service to Nova Scotia, and Regency Cruises' seasonal New York to Montreal trips.

5.3.4 Port of Portsmouth, New Hampshire

Overview

The State of New Hampshire Port is located along a three-mile stretch of the Piscataqua River in Newington and Portsmouth, New Hampshire. It features three active foreign trade zone locations totaling 135 acres and includes the Portsmouth Naval Shipyard in Kittery, Maine, an important submarine repair and overhaul facility. The channel serving the Port is maintained at a MLW depth of 35 feet, and has bridge clearances between 135 and 150 feet.

Local Authority

The New Hampshire State Port Authority (NHPA) is an autonomous state agency that is responsible for harbor management, port development and marketing and trade development. The NHPA has jurisdiction over 18 miles of coastline and nine rivers, and encompasses 13 cities and towns.

Container and General Dry Bulk Cargo Facilities

The NHPA Terminal is located on 11.1 acres of land adjacent to the Route 1 Bypass lift bridge. Facilities include a 600 foot long pier with a MLW depth of 35 feet, which can accommodate ships up to 700 feet long. The site also contains two warehouses, a scale house/office building, and approximately six acres of storage and marshaling space. Cargo handling equipment includes one 225-ton and one 165-ton mobile crane, and several 35-ton yard cranes.

Terminal cargo operations are contracted out to a private company, and the Isle of Shoals Steamship Company also operates its public cruises from the site. The NHPA Terminal primarily serves feeder vessels and barges carrying scrap metal, containers and a variety of general cargo.

A second public facility at the Port is the 400-foot long Portsmouth State Fish Pier, which is operated by the New Hampshire Department of Resources and Economic Development.

General and dry bulk cargoes are also handled at a number of private terminals in the Port. Typical products include chemicals, cement, gypsum and salt. In addition, the Simplex Wire and Cable Company ships undersea telecommunications cables from its waterfront plant.

Liquid Bulk Cargo Facilities

Several facilities are operated by private industries and utility companies, primarily handling petroleum products and chemicals.

Intermodal Connections

The public and private facilities at Portsmouth have easy access to major State and Interstate Highways leading to northern New England, Canada, and points west and south. On-pier rail service is available at the NHPA Terminal, connecting with Guilford Transportation Industries lines to the Midwest and Canada. Rail sidings also exist at many of the private terminals upstream of the NHPA terminal.

Port Activity and Markets

In 1990, the Port of New Hampshire handled approximately 4.8 million tons of cargo. Of this total, 4.4 million tons represented imports. Activity at the NHPA Terminal comprised approximately 353,000 tons of the total, most of which (283,000 tons) consisted of scrap metal destined for overseas markets. The remainder of the material handled at NHPA consisted of containerized general cargo (67,000 tons or 2,200 units) and coiled steel (2,900 tons).

The private terminals accounted for the majority of the cargo handled at the Port of New Hampshire, with a total of approximately 4.5 million tons. Petroleum products accounted for 2.6 million tons of the total and dry bulk materials were approximately 602,000 tons.

The Port's number one international trading partner is Canada, followed by the European countries.

5.3.5 Port of Boston, Massachusetts

Overview and Local Authority

The Port of Boston is New England's largest gateway for international shipping, typically handling 15-20 million tons of cargo per year. The Massachusetts Port Authority (Massport) is a quasi-governmental authority which owns the public terminals of the Port of Boston. Massport also owns the Boston Fish Pier, Commonwealth Pier, and several non-marine-related transportation facilities (Logan and Hanscom Airports, Tobin Bridge, etc.)

Massport's Maritime Division is responsible for planning, development, operations, maintenance and marketing of the Port of Boston's public terminals.

Container and General Dry Bulk Cargo Facilities

The major cargo terminal facilities operated by Massport consist of the following:

- **Moran Container Terminal (Charlestown)** is the largest container terminal in New England, and provides 1,100 feet of usable berthing space with a MLW channel depth of 40 feet, and 50 acres of container storage space. The Moran Terminal handles approximately 41,000 general cargo containers annually.
- **Conley Terminal (South Boston)** is a 101-acre multi-berth terminal providing 4,255 feet of total berthing space with MLW depths of up to 40 feet. The container portion of the facility has recently undergone an expansion to 2,000 feet of container berth, and is supported by 50 acres of storage space. Conley Terminal handles approximately 35,000 containers annually, and is also the location of Toyota Motors New England port which processes approximately 40,000 cars per year.
- **Harbor Gateway Terminal (South Boston)** consist of three separate facilities. The **Massport Marine Terminal**, with 800 feet of berthing space and a MLW depth of 35 feet, is used by Subaru for the discharge of automobiles, and for handling general bulk cargo. It is also presently being used as the staging area for construction of Boston's Third Harbor Tunnel. The **Black Falcon Cruise Terminal** is a 1,000-foot facility which handles 20-30 ocean-going cruise ships annually. The **Boston Army Base** provides 4,200 feet of berth for Navy vessels and 1,000,000 sq. ft. of covered storage space.

Additional Bulk Cargo Facilities

Approximately two dozen private bulk cargo piers are operated in the Port of Boston, primarily along the Mystic River and Chelsea Creek in Everett, Chelsea, and Revere. The major commodities handled are petroleum and LNG products, along with cement, seafood, salt, scrap metal and gypsum.

Intermodal Connections

The Port of Boston has excellent access to the Interstate Highway network. The main Massport facilities are also directly served by railroads (Conrail in South Boston and Guilford Transportation in Charlestown) offering service to Midwestern points such as Chicago.

Port Activity and Markets

The Port of Boston handled approximately 16.4 million tons of cargo in 1992. Of this total, approximately 15.3 million consisted of the bulk commodities described above, largely petroleum products. Most of the remainder consisted of high-value containerized general cargo, such as machinery, photographic equipment, computer parts and consumer goods. More than two dozen steamship lines serve the Port of Boston, and connect the area with 175 world ports, either directly or through feeder barge service via New York. The Port's major trading partners are Japan/Far East (37 percent of international trade) and northern

Europe (34 percent), followed by the Mediterranean countries, Australia/New Zealand, and South America.

5.3.6 Port of New Bedford, Massachusetts

Overview

The Port of New Bedford is located on the Acushnet River, approximately three miles above its mouth at Buzzards Bay. The Port includes facilities in both New Bedford on the west side of the river and Fairhaven on the east side. The main approach channel is approximately 300 feet wide and 30 feet deep at MLW.

Local Authority

The Massachusetts Department of Environmental Management (MADEM) owns and operates the State Pier, which is the main general cargo facility at the port.

General Cargo and Passenger Facilities

The State Pier is a 6.5-acre facility located on the westerly side of the Harbor. The north and east sides of the pier have lengths of 650 feet and 350 feet, respectively, and are used by ocean-going cargo vessels. The 710-foot south side of the facility is leased to the U.S. Coast Guard, and is home base to two 270-foot cutters. All berths at the State Pier have nominal depths of 28-30 feet MLW. Three warehouse buildings are located on the pier, ranging in age from ten to seventy years. Two of the buildings are single story structures with approximately 35,000 square feet of storage space each. The third building is two stories with a total floor area of about 70,000 square feet. There are no permanent cargo handling facilities, such as cranes, at the pier. A second, smaller cargo terminal facility at New Bedford is operated by Maritime Terminal Inc., and is located at Whalers Wharf.

Passenger ferry services at New Bedford include a year-round operation from Pier 3, immediately north of the State Pier, to Cuttyhunk Island, and a seasonal service from outer New Bedford Harbor to Martha's Vineyard.

Fish Pier Facilities

New Bedford is well known for its commercial fishing industry, and a number of independent and commercial fishing operations operate at the Port. Most of this cargo is unloaded at the City-owned docks which line the Harbor north and south of the State Pier facility.

Liquid Bulk Cargo Facilities

A major recipient of fuel oil is the Commonwealth Electric Company, which has a facility located south of the State Pier.

Intermodal Connections

New Bedford is located directly off of Interstate 195, which connects the Port with Cape Cod and with I-95 in Rhode Island. Another limited access highway, Route 140, connects the port with the Boston area. The State Pier is also adjacent to a rail spur connected to the Conrail system, but rail service is not operated to the pier at this time.

Port Activity and Markets

The Port of New Bedford handled approximately 456,000 tons of cargo in 1989, over 60 percent (285,000 tons) of which consisted of petroleum products such as fuel oil. Approximately 20 percent of the total (91,500 tons) consisted of dry bulk products, such as sand, gravel and crushed rock, handled at private terminals. Fresh seafood accounted for over nine percent of the total cargo by weight, but comprised a considerably higher portion in dollar value. New Bedford is, in fact, considered to account for one of the highest dollar values of any eastern U.S. port, due to the scallop trade.

The major commodities handled at the State Pier consist of palletized shipments of grapes, apples and other fresh fruit from Morocco and other northern African countries, and from South American countries such as Chile. This traffic is heaviest in the early winter months, and accounted for almost six percent (25,500 tons) of the 1989 total. In addition, two ships operate on a regular six-week turnaround schedule from New Bedford to Portugal, the Azores and the Cape Verde islands. Their regular cargo consists of miscellaneous personal effects outbound and food products inbound to New Bedford. These ships serve the large population from these overseas locations which resides in southeastern Massachusetts and Rhode Island.

5.3.7 Port of Fall River, Massachusetts

Overview

The Port of Fall River is located on the Taunton River, approximately 17 miles northeast of open ocean. The main approach channel to the port is 35 feet deep and begins in Narragansett Bay, continuing into Mount Hope Bay and the Taunton River. Fall River is Massachusetts second busiest commercial port, after Boston, and also hosts thousands of recreational boats during the summer season. The Fall River waterfront also hosts a permanent display of five U.S. Navy ships, and is a port-of-call for seasonal cruises between New York and Montreal.

Local Authority

The Massachusetts Department of Environmental Management (MADEM) owns the Fall River Line Pier ("State Pier") which is the main general cargo facility at the port. The pier is operated by Fall River Line Pier, Inc. a non-profit quasi-municipal private corporation, under a lease agreement.

General and Dry Bulk Cargo Facilities

The State Pier is a 10-acre facility located on the easterly side of the Taunton River directly beneath the I-195 high-level bridge. The terminal features two berths, one 600 feet long and the other 390 feet. Both berths have a depth of 35 feet MLW. There is also a new roll-on roll-off ramp which is 80 feet by 40 feet in dimension. The State Pier complex also contains 100,000 square feet of covered storage area, and a large amount of open storage space. Truck terminal space is also available adjacent to the terminal building, with room for several hundred container units.

Liquid Bulk Cargo Facilities

Major recipients of petroleum products at Fall River include the Shell Oil Company, located on the east side of the Taunton River upstream of the State Pier, the New England Power Company, at Brayton Point, and Montaup Electric Company on the west side of the Taunton River. Importers of chemical cargoes include Firestone Rubber, Tillotson Rubber, Borden & Remington, and Essex Chemical Corp.

Intermodal Connections

Fall River is located directly off of Interstate 195, which connects the Port with Cape Cod, and with I-95 in Rhode Island. The State Pier has three on-site railroad tracks which run the full length of the terminal. The trackage is part of the Conrail system, and connects at Taunton to all southern New England and inland points.

Port Activity and Markets

In 1991 the Port of Fall River handled nearly 3.9 million tons of cargo. Approximately 95 percent of this total was comprised of foreign and domestic imports of fossil fuel products to Shell Oil and the areas two major power generating plants. The remainder of the traffic at the Port consists largely of chemical imports, such as liquid latex, caustic soda, and sulfuric acid. Much of this traffic originates in Eastern Europe. Recent exports from Fall River have included waste paper to the Far East and South America and buses and heavy vehicles to South America.

5.3.8 Port of Providence, Rhode Island

Overview

The Port of Providence, Rhode Island is located along the Providence River, approximately six miles above it's mouth at Narragansett Bay. It features the full range of marine services, a foreign trade zone, bonded warehouses, and a customs inspection station. The 1,000-foot main approach channel to the port is maintained at a depth of 30 to 40 feet MLW.

Local Authority

The City of Providence owns the marine cargo terminal at Fields Point, on the west side of the Providence River. This facility is operated by the Providence Port Commission.

Container and General Dry Bulk Cargo Facilities

Six quay-wall continuous berths are available at Fields Point for the handling of general dry bulk and break bulk cargos. One of these berths can also accommodate tankers. The berths range from 450 to 688 feet in length, with a total length of over 3,300 feet. Depths off of the berths vary from 26 feet to 40 feet MLW.

Cargo handling equipment at the terminal includes two container cranes, although containers are not presently handled at Providence. Apron widths adjacent to the berths range from 75 feet to 300 feet, and there are approximately 14 acres available for open storage space, as well as 180,000 square feet of enclosed warehouse space.

Liquid Bulk Cargo Facilities

A number of private facilities on both sides of the Providence River handle liquid bulk cargoes including petroleum products and chemicals. A major petroleum facility is located at the Wilkes-Barre pier, in East Providence, which is owned by the Providence and Worcester Railroad. This terminal is leased and operated by a group of oil companies, which pumps inbound product directly to a large on-site tank farm for subsequent distribution by truck.

Intermodal Connections

The Port of Providence is adjacent to Interstate Highway 95, offering connections to all east coast and inland points. The Fields Point facilities are directly served by the Providence and Worcester Railroad, which serves southern New England and interchanges with the Conrail system at Worcester, Massachusetts. The Wilkes-Barre petroleum terminal in East Providence is also connected to the Providence and Worcester Railroad, although no rail service is operated to this facility at present.

Port Activity and Markets

The Port of Providence handled approximately six million tons of cargo in 1991. About 75 percent (4.5 million tons) of the total represented domestic receipts and foreign imports of petroleum products, mostly gasoline and fuel oil. Other major imports and domestic receipts include cement (340,000 tons), liquefied gas (200,000 tons) and asphalt products. The major export from the Port of Providence is scrap metal, typically accounting for approximately 360,000 tons. Other exports include wastepaper, steel and logs. The Port of Providence formerly handled automobile imports, but this traffic has largely been shifted to the port facility at Quonset Point/Davisville. Providence's international trading partners include Canada, Europe and China.

5.3.9 Port of Davisville, Rhode Island

Overview

The Port of Davisville comprises a portion of the former Quonset Point Naval Air Station and Construction Battalion Center, approximately 15 miles south of Providence on the west shore of Narragansett Bay. Approximately 1,200 acres of the Navy facilities have been

designated as the Quonset Point/Davisville Industrial Park, including 800 acres available for commercial/industrial development. An additional 900 acres is scheduled to be turned over by the Navy before the end of 1994. The facility also includes the former Naval Airport, featuring an 8,500-foot runway which can accommodate large cargo jets. The complex has been designated as a Foreign Trade Zone.

Local Authority

The Quonset Point/Davisville Industrial Park, including the Davisville port facilities, are owned by the State of Rhode Island, and managed by the quasi-public Rhode Island Port Authority and Economic Development Corporation.

General Dry Bulk Cargo Facilities

The Port of Davisville facilities include the 1,200-foot by 250-foot Pier 1 and the 1,200-foot by 650-foot Pier 2. A third pier, located adjacent to the Quonset Point airfield, is approximately 1,000 feet by 100 feet. Total combined berthing space at all three piers is approximately 6,800 feet. Depth is 30-32 feet MLW, and the Narragansett Bay approach channel to the facility is maintained at 32-35 feet MLW. Approximately 100 acres of storage space is available adjacent to the Davisville piers, and this will be increased to 200 acres following the transfer of additional land by the Navy in 1994.

Intermodal Connections

Vehicular access to Quonset Point/Davisville is via two-lane roads which lead to/from State Route 4. Route 4 is a limited access freeway that connects with the Interstate Highway system near Providence. The State is currently finalizing an EIS for improved access. Rail service at the site is provided by over 25 miles of on-site trackage, including spurs which directly serve all three piers. Rail service from the facility to the Amtrak Northeast Corridor Mainline at Davisville Junction (approximately four miles) is provided by Seaview Transportation. Freight service from Davisville Junction to the Conrail system at Worcester is provided by the Providence and Worcester Railroad. The access road EIS is also evaluating the potential for commuter rail, conventional bus service, light rail transit and ferry service from the East Bay.

Port Activity and Markets

A large portion of the current marine activity at Quonset Point/Davisville consists of automobile imports and exports. In 1992, approximately 30,000 vehicles were off-loaded at the port, from Saab, Chrysler, and Volkswagen. Chrysler and Volkswagen suspended their activities at the Port in 1993, in part due to physical restrictions on the regions' railroads, which prevent the use of tri-level auto-carriers. As mentioned previously, the State is undertaking an EIS to add a third track to the Northeast Corridor mainline to improve this situation. Seafood is also an active commodity at the port. The Sea-Freeze Company operates a seafood processing facility adjacent to the Davisville piers, at which fresh squid, mackerel and other fish are frozen, packaged, and then shipped to both foreign and domestic destinations. An additional import at Davisville in recent years has been granite quarried in Italy, for use on U.S. construction projects.

5.3.10 Port of New London, Connecticut

Overview

The Port of New London is located on the Thames River, just upstream of its outlet to Long Island Sound. New London has the deepest harbor in Connecticut, with a main shipping channel of 36-40 feet at MLW, and accommodates dry cargo vessels of up to 650 feet in length, and tankers up to 800 feet long. The Port, which also includes Groton, Connecticut on the Thames easterly shore, is home to a variety of defense-related facilities. These include the General Dynamics Electric Boat Shipyard, U.S. Navy Submarine Base, U.S. Coast Guard Academy and the U.S. Navy Underwater Systems Center.

Marine services available at the Port of New London include one floating dry dock, one graving dock and three marine railways. At the present time, drydocks of sufficient capacity to handle cargo ships are not available to the public.

Local Authority

The State of Connecticut, through the Department of Transportation's Bureau of Aviation and Ports, owns and operates the State Pier which handles a variety of dry cargoes. The City of New London operates the City pier, adjacent to the Amtrak railroad station, which serves ferries to Orient Point and Fishers Island, New York, and Block Island, Rhode Island.

General and Dry Bulk Cargo Facilities

The State Pier is 1,000' long and has charted berths with depths of 31'-37' MLW. On-site facilities also include warehousing, outside storage, and cargo handling cranes. The pier handles a variety of neobulk cargoes. Due to its extremely deteriorated condition, the State Pier suffered a partial collapse in mid-1993 and has been out of service since that time. As of the end of 1993, short-term emergency repairs are in progress.

The Central Vermont Railway, a subsidiary of Canadian National Railways, owns and operates its own general cargo transfer pier adjacent to the State pier. This pier is presently inactive and is used for storage only.

Liquid Bulk Cargo Facilities

Dow Chemical Company has a wharf with 22' MLW, and Pfizer Corporation, a wharf with 18' MLW. Amerada Hess Corporation has a pier with 36' MLW and tanker discharge lines of 10" and 12."

Intermodal Connections

The Port of New London is conveniently located to Interstate Highway 95, which offers connections to all New England and inland points. Railroad connections are also excellent at New London. The Central Vermont and State piers are directly served by the Central Vermont Railway, which offers service to the Connecticut Valley and interior New England, with connections to the Conrail system at Palmer, Massachusetts. The Providence

and Worcester Railroad also serves the New London/Groton area, with connections to Conrail at Worcester, Massachusetts.

Port Activity and Markets

Overall cargo handled at the Port of New London, including private facilities, totalled one million tons in 1991. Of this total, 69,000 tons were handled at the State Pier, consisting primarily of wood pulp (38,900 tons) sulfuric acid (27,900 tons) and steel products (679 tons). The major portion of the remaining cargo handled consisted of fuel oil (750,000 tons), chemicals such as sulfuric acid, and general cargo, such as molasses, animal feeds, and lumber handled at the Central Vermont Railway pier. As noted above, both the State and Central Vermont piers are presently inactive.

5.3.11 Port of New Haven, Connecticut

Overview

Port of New Haven is the largest port in Connecticut and is considered the busiest port between Boston and New York City. It consists of a number of privately operated deep and shallow draft terminals located at the mouth of the Quinnipiac River. The main New Haven Harbor Channel has a depth of 35 feet at MLW, and a width of 400 feet and accommodates ships in the 20,000 to 40,000 dwt tonnage range. Upstream of the Tomlinson and Quinnipiac Bridges, traffic is limited to barges and small commercial fishing vessels. Marine services available in New Haven include fuel barges and terminals, tugboats, launches, ships stores and skin divers.

Local Authority

There is no official involvement by state or local authorities in the day-to-day commercial operation of the Port. Two independent companies, New Haven Terminal Inc. and Gateway Terminal Inc. own and operate public deep water piers. The State of Connecticut, through its Department of Economic Development's International Division, provides assistance and information to parties interested in international export/import activities. In addition, the New Haven Chamber of Commerce is the Grantee for a 5,000 square foot Foreign Trade Zone located in North Haven.

General and Dry Bulk Cargo Facilities

The New Haven Terminal facility consists of three berths, oriented 90-degrees to the main channel. The Scrap Dock is 650 feet long with 35 feet at MLW, and is used for handling scrap metal and various types of dry cargo. Two gantry cranes are located on the dock and additional mobile cranes are available. The Finger Pier is also 650 feet long with 35 feet at MLW. The north side of this pier is used mainly by tankers. The slip is 196 feet wide, and two vessels may be berthed simultaneously. The south side of the Finger Pier is a tanker or general cargo berth which can accommodate ships 700 feet in length. Depth is 40 feet at MLW.

Gateway Terminal operates a new (1991) concrete pier 750 feet in length which provides up to three berths. The south side can accommodate 40,000 dwt tankers and dry cargo vessels up to 700 feet long, with 35 feet draft at MLW. The north side has a 30-foot draft at MLW and is used mainly by smaller ships and barges. Facilities on the pier include two 40-ton gantry cranes and additional 25-ton mobile cranes.

Liquid Bulk Cargo Facilities

Gateway Terminal operates a petroleum transfer and oil storage tank farm with a total capacity of 500,000 barrels. This fuel facility is connected to the Buckeye Jet Line Inc. pipeline, which extends from New Haven harbor to Springfield, Massachusetts, serving many of the cities and towns en route. Additional deep-draft (34 feet or greater) terminals are owned by Gulf Oil and Exxon, which have piers 675 and 750 feet long respectively. There are also seven shallow draft barge terminals which handle bulk petroleum products for use by local utilities and for inland distribution by the major oil companies.

Intermodal Connections

Direct rail connections are available on the New Haven Terminal pier to interior New England points. There is also easy access from the Port area to Interstate Highway 95, serving the East Coast, and Interstate Highway 91 serving the Connecticut Valley and Canada.

Port Activity and Markets

The Port of New Haven handled 8.1 million tons of cargo in 1991. Approximately 80 percent of this tonnage handled consisted of incoming petroleum products. The major non-petroleum commodities include iron and steel scrap exports (285,000 tons) and imports of iron and steel structural shapes, and unworked lead, copper and zinc (400,000 tons). Other major bulk materials handled included chemicals (250,000 tons) and building cement (175,000 tons). New Haven accounts for over 90 percent of the copper, lead, zinc, and basic chemicals handled at New England's major ports, and also is responsible for a significant share (over 25 percent) of iron and steel scrap and lumber.

5.3.12 Port of Bridgeport, Connecticut

Overview

The Port of Bridgeport is located on Long Island Sound at the mouth of the Pequonnock River, and features a channel 400 feet wide with a MLW depth of 35 feet. Marine services including tugboats, ship's stores and launch service are available from the Port of New Haven. There is no fuel barge service available, although truck deliveries may be arranged in an emergency.

Local Authority

The City of Bridgeport Port Authority owns and operates the Union Square Dock adjacent to Interstate Highway 95. The passenger ferry to Port Jefferson, New York utilizes this

facility. A private company, New Haven Terminal, Inc., operates the Cilco Terminal, where general cargo is handled.

General and Dry Bulk Cargo Facilities

The Cilco Terminal is a bulkhead dock, approximately 1,100 feet long, which can accommodate two ships at the same time. Several mobile cranes are available on-site, and the MLW depth is 33 feet. The terminal handles a variety of dry bulk cargoes, as well as fresh fruit imports of the Turbana Banana Company.

Liquid Bulk Cargo Facilities

Several terminals which receive fossil fuel products are located at Bridgeport. The Shell Oil Company berth is located on the east side of the harbor. This off-shore oil tanker facility is approximately 200 feet long and has received vessels up to 650 feet in length with 35 feet draft. Vessel size at this facility is governed by the bow to manifold distance (300 to 350 feet).

The United Illuminating Company generating station is located on the west side of the channel, and features both oil and coal unloading docks. Ship size at the oil facility is governed by a bow to manifold distance of 350 to 375 feet. Depth at MLW is 32 feet, and the facility has received vessels of up to 60,000 dwt.

Intermodal Connections

The Port of Bridgeport has access to Interstate Highway 95, serving all of the Eastern seaboard.

Port Activity and Markets

The Port of Bridgeport handled 3.3 million tons of cargo in 1991. Approximately 2.0 million tons of the total were petroleum products such as gasoline and fuel oil received from coastal barges. Incoming dry bulk products such as sand, gravel and crushed rock comprised about 300,000 tons, and coal and lignite 250,000 tons. Iron and steel plates and structural shapes are another major commodity in Bridgeport, totalling approximately 225,000 tons. The Port of Bridgeport is an active Port of Entry for tropical citrus fruit and bananas, typically accounting for about six percent (approximately 200,000 tons) of total U.S. banana imports. Bridgeport also receives approximately 10,000 tons of reverse-season shipments of palletized citrus fruit from Morocco. This is one of the largest movements of palletized (as opposed to containerized) citrus into the U.S., and is shipped inland to an importer in Toronto, Canada.

■ 5.4 Planned Facilities

5.4.1 Maine

Port of Eastport

The Port of Eastport has experienced a dramatic increase in cargo tonnage since the construction of the existing breakwater pier, which was completed in 1983. Continued expansion at this facility, however, is hampered by the severe lack of storage, staging, and warehousing capacity at the downtown location.

In order to evaluate future growth needs, the Eastport Port Authority commissioned a market development study and feasibility analysis for port expansion. This study was completed in 1990, and concluded that Eastport is in a position to capture additional export traffic in forest products such as woodpulp, logs, and lumber. The most likely demand, given the construction of new port facilities, was estimated to be approximately 393,000 tons annually by the year 2010.

This projected demand was then translated into a set of physical facility requirements in order to establish a plan for port expansion. It was determined that to meet this demand, port facilities should include, at a minimum, one ship berth, 102,000 square feet of covered storage or warehouse space, and 54 to 82 acres of open storage area. The estimated cost of developing such a facility, in 1990 dollars, was in the range of \$18.5-\$20.9 million. The economic benefits of such a new facility over its 20-year life, were estimated at \$42 million, which represents a benefit/cost ratio of two to one. Benefits were considered to include such factors as direct Port Authority revenue, transportation savings by Maine shippers, direct employment, and construction employment.

Eastport has moved ahead with the implementation of the study recommendations. A new port facility meeting the physical requirements outlined above is planned for the Estes Head area, southwest of the present facility. The Eastport Port Authority has obtained the necessary Corps of Engineers and Department of Environmental Protection permits, and has completed the necessary engineering designs. Site clearing operations are scheduled to begin early in 1994, and full build-out is expected to be complete in 1996. A 10,000 square foot warehouse has already been completed at Estes Head, and is in use to provide storage for the existing port operations.

Following completion of the new Estes Head port, the existing facilities downtown will continue to be operated by the Port Authority. The pier will see increased public use, and will also serve as a backup cargo facility.

Port of Searsport

Searsport is the proposed site for construction of a major international cargo port, which would be located on Sears Island, across the harbor from the existing facilities at Mack Point. The Sears Island Cargo Port has been actively promoted by the Maine Department of Transportation for a number of years, and is projected to diversify the area's marine

commerce by handling container cargo, agricultural products, and bulk wood products such as wood chips.

Initial facilities at Sears Island are to include a 780-foot by 280-foot pier, with two berths capable of accommodating ships with up to 45-foot draft at MLW. Space is also available at the site to add up to four additional berths in the future. A spur from the main line of the Bangor & Aroostook Railroad to the site is also planned as part of the initial construction, including a rail head on the pier itself.

Construction on the \$21 million facility was begun in 1984 but was halted in 1985, when it was determined that an Environmental Impact Statement (EIS) would be necessary. The EIS was completed and work resumed in 1988. Lawsuits against the project were brought by the Sierra Club and other groups and work was again suspended in 1988. Preparation of a Supplemental EIS is presently underway, and the document is scheduled to be released for public agency review in mid-1994.

Port of Portland

The Port of Portland has been involved for over ten years in undertaking a program of planning, multi-million dollar capital improvements, and marketing studies. As a result, Port facilities are considered to be in excellent condition to handle projected increases in both cargo and passenger traffic. Examples of improvements which have recently been completed include a \$3 million reconstruction of the International Marine Terminal, investments of \$15 million in fishing facilities, including the Portland Fish Exchange, and establishment of the \$45 million ship repair facility operated by Bath Iron Works.

An additional construction project which will benefit the port is replacement of the existing Portland-South Portland bascule bridge with a new \$160 million high level structure. The new bridge will improve navigation to the terminals located upriver, and will allow Portland to be served by much greater sizes and classes of ships. Work on the new bridge is now underway, and construction is expected to be complete by 1997.

5.4.2 New Hampshire

Port of Portsmouth

In 1993, following four years of planning, the New Hampshire Port Authority (NHPA) obtained the necessary Army Corps of Engineers permit for a major port expansion project. The permitting process included detailed plans for wetland mitigation and restoration of tidal marshes, and involved a creative integration of industrial port functions and public access to the waterfront.

The proposed facilities include three new piers. The first new facility, to begin construction early in 1994, will consist of a 360 foot long container/barge berth which will be situated north of the Route 1 Bypass Bridge, at Cutts Cove. The second phase of the project is a 700-foot long pier on the north side of Cutts Cove, which will serve the scrap metal export operation which is presently conducted at the existing NHPA facility south of the bridge.

Finally, the existing NHPA facility will be refurbished and returned to its original purpose as a general cargo pier with on-site warehousing, and a new multi-use 700-foot pier, will be built at the southerly end of the site. This latter pier will serve public-oriented uses, such as cruise and excursion ships, and will also host visits by naval vessels and ships of historic interest.

The expanded Port of New Hampshire facilities are expected to allow the NHPA to increase its' ability to cost-effectively handle a wider variety of exports and imports which cannot be accommodated at the existing site.

5.4.3 State of Massachusetts

Port of Boston

During the past ten years, Massport has invested approximately \$116 million to modernize and expand the marine facilities at the Port of Boston. Spending in 1992 included over \$6.5 million to improve the Moran Terminal in Charlestown; \$1.3 million in improvements at the Harbor Gateway terminal; and \$1.8 million at the Conley Terminal in South Boston.

The 1992 investment at the Conley Terminal represented the first phase of a five-year \$50 million expansion program for this facility. The construction will result in the terminal being able to accommodate two of the largest next-generation container ships simultaneously. Phase one of the work at Conley was completed during 1993, and resulted in a doubling of berth space, to 2,000 feet. In addition, the two existing container cranes are to be raised 20 feet, two additional 40-ton Post-Panamax gantry cranes are to be installed and operational by 1995, and storage space is to be expanded.

To improve intermodal opportunities, rail service to the port is being upgraded. The Commonwealth of Massachusetts is assisting with development of an inland container distribution center at Fort Devens, approximately 30 miles from the Port, and has proposed to improve clearances along Conrail and Guilford Transportation rail lines which cross the state. Improved clearances will allow double-stacking of containers on railcars and improve the Port of Boston's competitive position. A limited container service from the Moran Terminal to Chicago via Fort Devens was begun in 1993.

Also in the design and permitting phase, is a plan to undertake dredging of the Port's major shipping channels, in order to accommodate the larger commercial vessels expected to be placed in service in the near future.

Finally, the construction of Central Artery/Third Harbor Tunnel, which is now underway, will feature large-scale improvements to the roads serving the South Boston port area, and will provide the port with a direct vehicular connection to Logan Airport by the year 2000. Massport is playing a major role in the ongoing construction of this project, which involves using the Authority's facilities for such activities as dredging, barging, outfitting of the immersed tube highway tunnels and construction staging.

Port of New Bedford

In December 1993, the Massachusetts Department of Environmental Management retained a private consultant to begin a study of the State Pier at New Bedford. The purpose of the study will be to evaluate the need for new or rehabilitated facilities, and to assess the potential for attracting additional types of cargo to the Port.

Port of Fall River

There are presently no plans for significant physical improvements or expansion at the Port of Fall River. The State Pier is considered to be of sufficient capacity and condition to handle existing and projected cargo traffic. Long-term plans for the Port may involve an increase in cruise ship operations, which conceivably could require terminal construction. No action is imminent however.

5.4.4 State of Rhode Island

Port of Providence

City of Providence Facilities

At the present time there are no major physical improvements planned for the City of Providence port facilities at Fields Point. There have been discussions within the city for some time regarding a possible sale of the port to a private operator, but there appears to be no definite plan to do so as of the end of 1993.

Providence and Worcester Railroad Facilities

The Providence and Worcester Railroad has, during the past 20 years, conducted various stages of planning and construction for the development of a deep-water port south of the existing Wilkes-Barre pier in East Providence. The railroad owns 45 acres of tidal flats south of the pier, and the site has a direct rail connection to the P&W's interchange with the Conrail system at Worcester, Massachusetts. Progress has been irregular in developing the new port, due to a combination of environmental permitting issues and economic conditions.

Work to date consists of construction of a berm enclosing the site, and dredging the channel in front of the berm to a depth of 40 feet. This operation was completed in 1992. At present, all the necessary permits for filling the tidelands behind the berm have been obtained and/or extended, and filling operations are currently underway. The railroad is presently soliciting proposals to select a lead marketing consultant for the project. This will allow a detailed analysis of the port's target commodities and markets and help to define the physical facilities which will be needed at the site. Possible cargos to be handled at the port include containers and general dry break-bulk cargos which would be transferred from ship to rail. No firm timetable has been established for the ultimate build-out of the project at this time.

Port of Davisville

One of Rhode Island's top economic development priorities at this time is the promotion of the Quonset Point/Davisville Industrial Park. The site is seen as the key element in preserving and modernizing the state's industrial and manufacturing base. In order to enhance the attractiveness of the Port and Industrial Park to the regions' businesses, the State has developed plans for improvements to the marine, rail and highway infrastructure serving the site, as described below.

Marine Improvements

Funds have already been appropriated for several capital projects at the Davisville Piers. Work underway at this time includes repairs to the bulkhead beneath Pier 1, to be completed in 1994. In addition, funds for engineering have been appropriated for a \$1.2 million project to replace the bulkhead between Piers 1 and 2.

Engineering is also complete, although construction funds have not yet been approved, for a \$4 million maintenance dredging project; a \$2.5 million project to improve paving and drainage at Pier 2 and the adjacent 45-acre laydown area; and installation of high mast lighting at Pier 2, which presently operates during daylight hours only. Another project in the planning stage is a \$6.1 million program to rehabilitate the support piles and fender system at Pier 1.

Rail Improvements

The State has also identified two crucial railroad facility improvements that are considered essential to allow the full potential of the Industrial Park and Port to be exploited. The first is the addition of a third track to the Amtrak mainline between Davisville Junction and Boston Switch (just north of Providence), in order to provide additional capacity for freight movements associated with increased automobile, container and bulk aggregate handling at the port. This expansion of rail capacity is particularly critical in light of Amtrak's plans for greatly increased high-speed passenger train service on this route following completion of the Northeast Corridor Improvement Project (NECIP). Amtrak and the Federal Railroad Administration have recently agreed to incorporate the third track in the upcoming construction of improvements, and an EIS is pending.

The second important rail improvement project is to provide increased vertical clearances between Davisville Junction and Boston Switch, in order to accommodate tri-level auto-carriers and double stacked container trains. Both of these types of rail cars are now considered industry standards. No commitment has been obtained yet to include these improved clearances as part of the NECIP.

Highway Improvements

An FEIS is due in March of 1994 for a proposed limited access highway (Route 403) which will connect the Quonset Point/Davisville Industrial Park with the existing Route 4 freeway in East Greenwich. The new road will allow Port traffic to bypass the local two-lane roads in the area, and facilitate access to the Interstate Highway System in Providence.

5.4.5 State of Connecticut

Port of New London

State Pier

The State Pier at New London suffered a partial collapse in mid-1993, and has been inactive since that time. Emergency short-term repairs are presently being undertaken to restore the facility to its pre-existing condition. In the long term, the State of Connecticut, as part of its overall transportation plan, has budgeted \$20 million for a project to demolish the existing, severely deteriorated pier and replace it with a new facility of the same size. Engineering for the new pier is underway as of the end of 1993. Plans call for warehousing functions which are presently located on the pier itself, to be moved on-shore, and for the new pier to have a loading capacity of 1,000 pounds per square foot.

A Port Development Study for New London is presently being undertaken. Preliminary conclusions of the study indicate that neobulk cargoes, such as forest products (pulp, lumber, newsprint, wastepaper), automobiles, and iron and steel products (sheets, coils, structural shapes) offer the greatest potential to the Port.

Central Vermont Railway Pier

The future of the Central Vermont pier remains uncertain at the end of 1993. The Canadian National Railway has recently announced its intention to sell the Central Vermont Railway, and the implications of the sale on the company's New London facilities is not known at this time.

Port of New Haven

There are no plans for significant improvements at the Port of New Haven at this time. A Port Development Study is presently underway, and is expected to be complete in early 1994.

Port of Bridgeport

A Port Study which was presently completed indicates that Bridgeport has the potential for expansion of its fruit import operations. The existing Cilco Terminal, however, lacks sufficient storage capacity to handle increased volumes. The Bridgeport Port Authority sees the need to purchase additional land in order to construct new pier facilities, which could be either operated by the City, or leased to a private operator such as New Haven Terminal. No state funding is currently planned to be appropriated for such purposes however, and the Port Authority has only limited means to raise funds on its own.

■ 5.5 Oil and Natural Gas Transmission Pipelines

The following is a brief summary of the major oil and natural gas transmission pipelines in New England. The major facilities are shown in Figures 5.15 and 5.16.

5.5.1 Oil Pipelines

Crude Oil

Pipelines transport millions of barrels of crude oil from producing fields and ports to refineries. In New England, the only major supplier in this form is **Portland Pipeline Company's** Portland / Montreal Pipeline. This is an 18" line running from a marine terminal in Portland, ME to a refinery in Montreal, Canada. The average capacity of the line is 186,000 barrels per day.

Petroleum Products

These commodities, which include gasoline, home heating oil, jet fuel, and kerosene, are also transported either directly from refineries, or from receiving ports. Pipelines play a major role in their transport to consuming markets.

Originating at a waterfront terminal in the Port of New Haven, the 12" Jet Line is owned and operated by **Buckeye Pipeline Company**. It has a capacity of 62,000 barrels per day of #2 fuel oil and services markets in Hartford, CT (including Bradley International Airport) and Springfield, MA (including Westover Air Force Base). This pipeline can handle all conventional petroleum products.

Mobil Pipeline Company owns a 6" line which services the state of Maine. It starts at a Mobil's marine terminal in Portland, travels to a truck terminal in Auburn, and ends at a distribution terminal in Bangor. Daily capacity is 10,000 barrels per day of #2 fuel oil. Mobil also owns another 6" line which travels from a water terminal in the port of Providence, RI, to Springfield, MA and delivers 12,000-16,000 barrels of #2 fuel oil to surrounding markets.

5.5.2 Gas Pipelines

Algonquin Gas Transmission Company owns and operates a 30" pipe main which enters Connecticut near Danbury from lines beyond feeding a compressor station in New York State. The main travels through Connecticut in a northeasterly direction branching near Plainville, south to Guilford, north to Farmington, and further east to branch again south to Waterford, CT and Westerly, RI. The main exits Connecticut near Putnam, and branches into two mains, one spreading south and east, servicing Providence and Portsmouth, RI, and Fall River, New Bedford, Plymouth, and Sagamore, MA. The other branch of the main travels north and east, servicing the suburbs around Boston.

Granite State Gas Transmission Inc., in addition to owning the Portland Pipeline Corporation's pipeline discussed below, operates an 8" line from Portland, ME along the coast to service those counties all the way to Portsmouth NH, and ending in Haverhill, MA where it connects with the Tenneco line network. Plans are proposed for the line to be replaced with a 24" line.

Iroquois Gas Transmission System was created through a partnership of a dozen companies which own and operate a 30" pipeline which connects to TransCanada Pipelines near Waddington, NY, reduces down to 24" in Wright, NY, and enters New England near New Milford, CT. The main travels southeast servicing counties surrounding Brookfield, Shelton, and Milford, CT and on to Long Island, NY.

Portland Gas Transmission System is sponsored by a group known as The Line Consortium, which includes Granite State, Gaz Metropolitan, Shell Canada, and Tenneco which currently plans to build a new 30" line next to the Portland Pipeline Corporation line.

Portland Pipeline Corporation leases an 18" pipeline from Granite State Gas Transmission Inc. which services counties surrounding the main from Portland, ME to Jay, VT. It links into Canada's TransCanada Pipelines near Montreal.

Tennessee Gas Pipeline Company (Tenneco) has a 36" pipe main which enters New England near Pittsfield, MA from New York State. It travels north in a branch to Adams, MA and south in a branch to Torrington, CT. The main continues east to near Westfield, MA where a branch travels to Northampton, MA. In Agawam, MA, there is a compressor station which feeds a branch which travels south to Greenwich, CT. The pipe main then splits, one branch going south flowing through a compressor at Mendon, MA, servicing Providence and Cranston, RI. The northern half of the main enters a compressor near Framingham, MA feeding lines which run up to Concord, NH. A line owned by Energy North Natural Gas then carries service up to Tilton, NH. Finally, an eastern branch ends in a line to Gloucester, MA. As previously mentioned, there is a connection to Granite State Gas Transmission, Inc. in Haverhill, MA.

Vermont Gas Systems Transmission Line is a 10" main which is approximately 55 miles long and extends from the Canadian/Vermont border southward providing service to counties surrounding Swanton, St. Albans, and Burlington. All of Vermont's gas comes from this line which connects to Canadian suppliers.

■ 5.6 Summary and Implications for Next NETI Tasks

5.6.1 Institutional

The study has found that there is a range of government involvement at the twelve New England Ports which were investigated as "regionally significant." Outright public or quasi-public ownership and/or operation of general cargo facilities exists at most of the locations studied. At the locations where this is not the case (Searsport, Portland, New Haven), government agencies are involved in either planning new facilities (Searsport) or promoting the use of the port as a whole, including private facilities (Portland, New Haven). In all locations studied, there is significant state-level agency involvement in at least promoting the use of the port, with the exception of Providence, which appeared to rely for the most part on local-level marketing and operation.

5.6.2 Market Overview

The New England ports are predominantly receiving ports. In 1989, the most recent year for which full statistics are available on a port-by-port basis, 93 percent of cargo handled was inbound. Approximately 48 percent of the total tonnage consisted of foreign imports, and 45 percent was comprised of domestic receipts from other coastal locations. Foreign exports consisted of approximately three percent of total tonnage.

The most common cargo (82 percent of total) handled in New England, by tonnage, are **liquid bulk** materials such as home heating oil, fuel oil for electric power generation, gasoline for distribution to the regions' service stations, and a variety of chemical products. Approximately half of the liquid bulk cargoes received were shipped coastwise from other Atlantic seaboard ports, with the remainder being imports from overseas.

The next major category was **dry bulk** products, which accounted for about 13 percent of the total in 1989. Approximately 23 percent of the dry bulk total was imported from overseas, and 56 percent was received from other coastal ports. The received material typically included coal to be used at electric power stations, salt, and cement and aggregates for construction purposes. The remaining 21 percent of dry bulk cargoes consisted of exports (iron and steel scrap, wastepaper, etc.)

General cargo, which is mostly containerized, accounted for approximately three percent of the total, and most of this cargo is presently handled at Portland, Portsmouth, and Boston. The majority of general cargo was imported (66 percent). The remaining tonnage, consisting of **neobulk** commodities such as forest products, iron and steel sheets, coils and shapes, and automobiles, amounted to approximately two percent of the total. Approximately 94 percent of neobulk cargoes were imports.

5.6.3 Implications for Next NETI Tasks

On a sheer tonnage basis, the total trade from the top ranked ports in each state (Portland, Portsmouth, Boston, Providence, and New Haven) accounts for over 80 percent of the 12-port total. However, it appears that each of the smaller ports has a significant niche to fill. This is true either due to geography, as in the case of Eastport which offers significant advantages in serving the northern Maine forest market; physical situation, such as at the proposed Davisville site with its potentially large industrial area and excellent access to intermodal connections; or unique commodity mix, such as the fruit operations at Bridgeport and New Bedford.

It is therefore recommended that each of the ports studied be considered in further detail in the next phase of NETI. This is particularly true because many of the ports, both large and small, have had recent marketing and facility expansion studies completed, or are in the process of having them done. These studies will provide an excellent resource for comparing the future potential at each location. The next phase of NETI should involve a detailed analysis of these different studies to "normalize" assumptions and data which were used. This will serve as a valuable starting point for additional marketing and operational analysis leading to development of a cooperative investment strategy.

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Tables

Table 5.1 Summary of Regionally Significant Port Facilities

Port	National Park	Annual Tonnage	I/E*	Major Cargo
Eastport, ME	NR	213,000	E	Wood products
Searsport, ME	145	1,104,000	I	Dry cargo and petroleum products
Portland, ME	61	12,700,000	I	Petroleum products and dry cargo
Portsmouth, NH	89	4,800,000	I	Petroleum products and dry cargo
Boston, MA	32	16,400,000	I/E	Petroleum products and high-value containerized cargo
New Bedford, MA	123	456,000	I/E	Petroleum products, dry bulk products, and fresh seafood
Fall River, MA	87	3,900,000	I	Petroleum products and chemicals
Providence, RI	73	6,000,000	I	Petroleum products; cement, liquefied gas and asphalt products
Davisville, RI	NR	NA	I/E	Autos, seafood, granite
New London, CT	138	1,000,000	I	Petroleum products; wood pulp, sulfuric acid and steel products
New Haven, CT	60	8,100,000	I	Petroleum products; iron and steel scrap products; lead, copper and zinc
Bridgeport, CT	92	3,300,000	I	Petroleum products; dry bulk products; iron and steel plates; fruit

* Import/export (predominant).

Figure 5.1 New England Ports – Annual Tonnage by Location

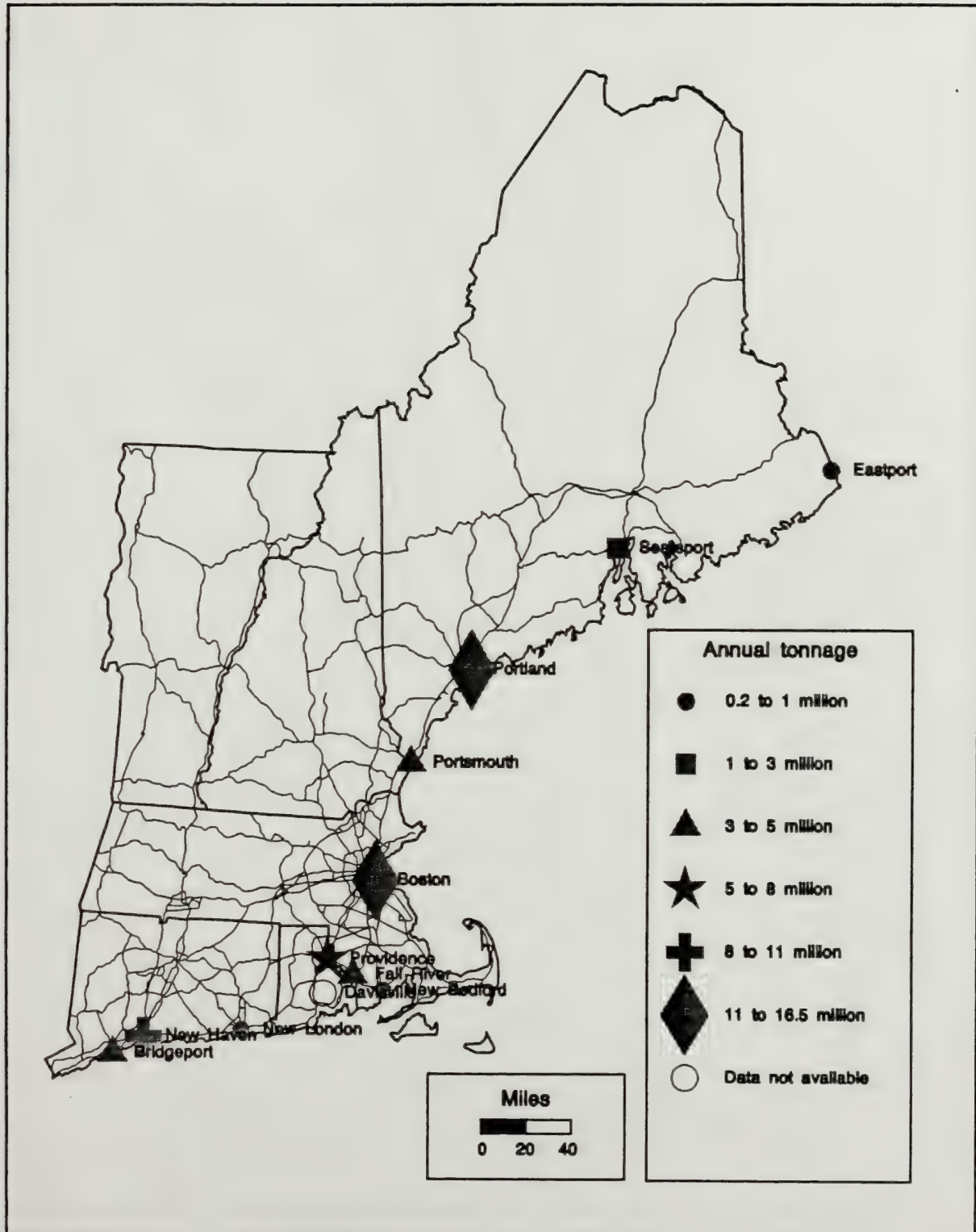


Figure 5.2 Passenger Ferry Services

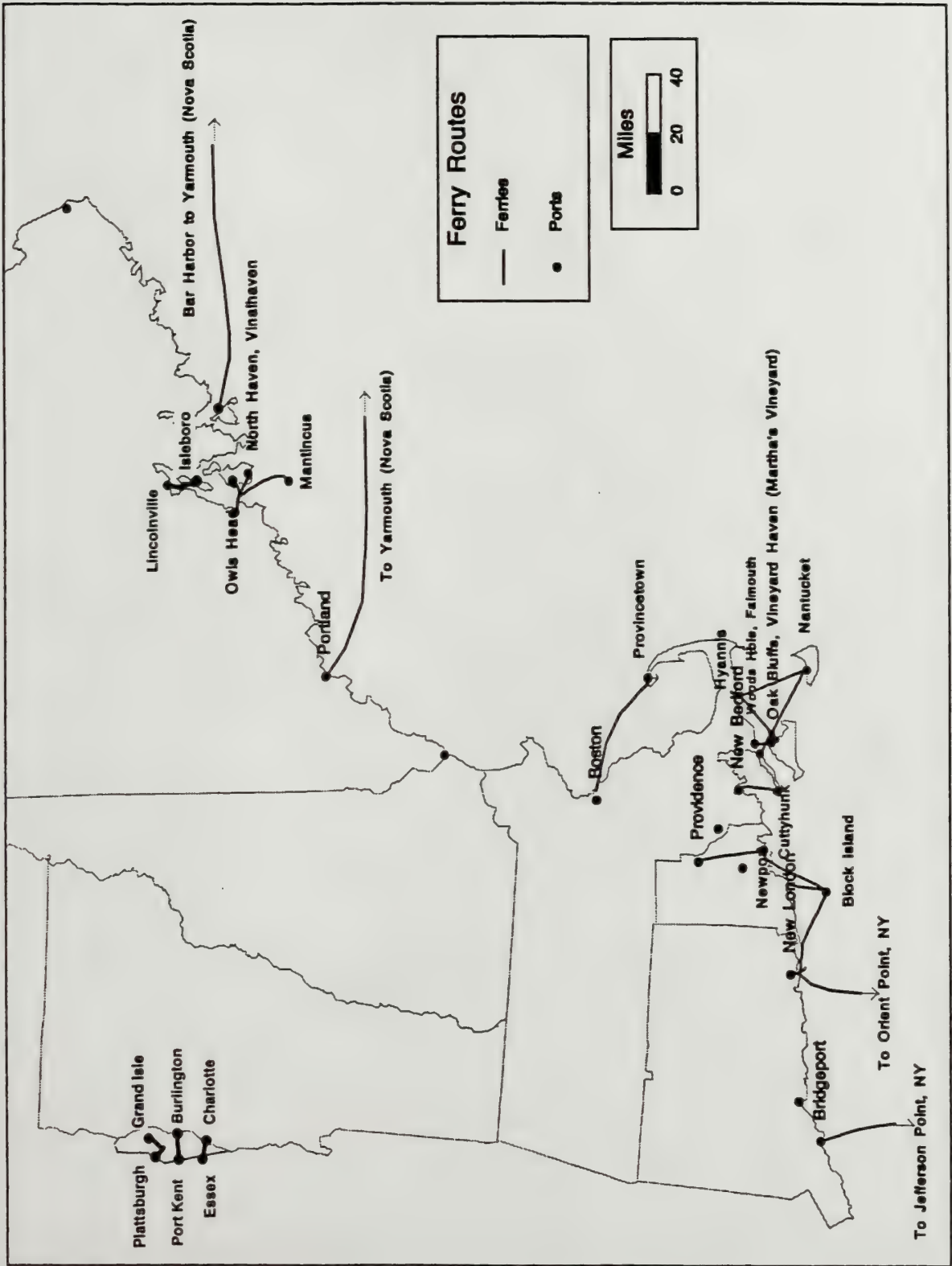
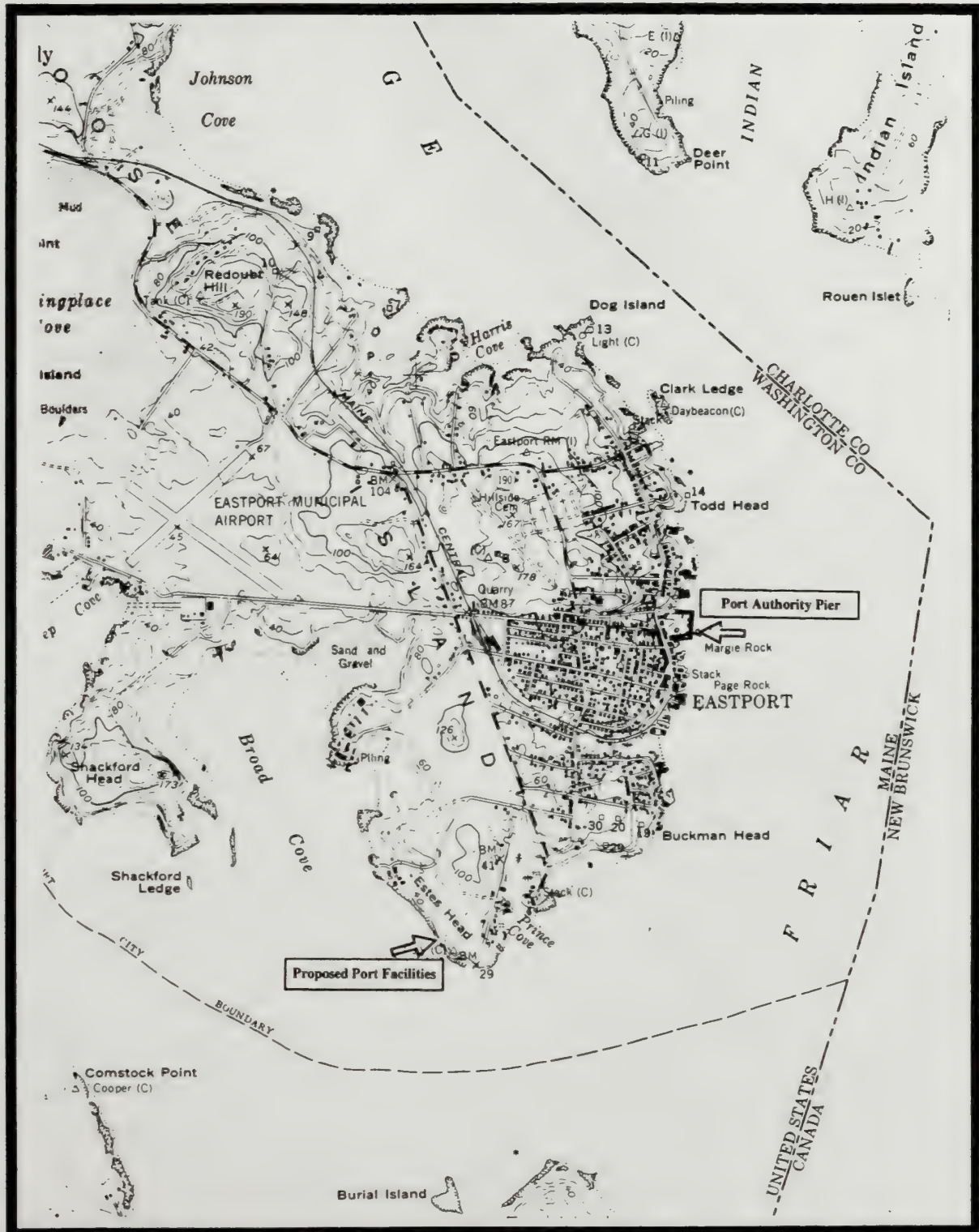


Figure 5.3 Eastport, Maine



Source: USGS, Eastport, Maine

Scale in feet

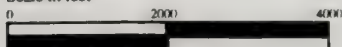
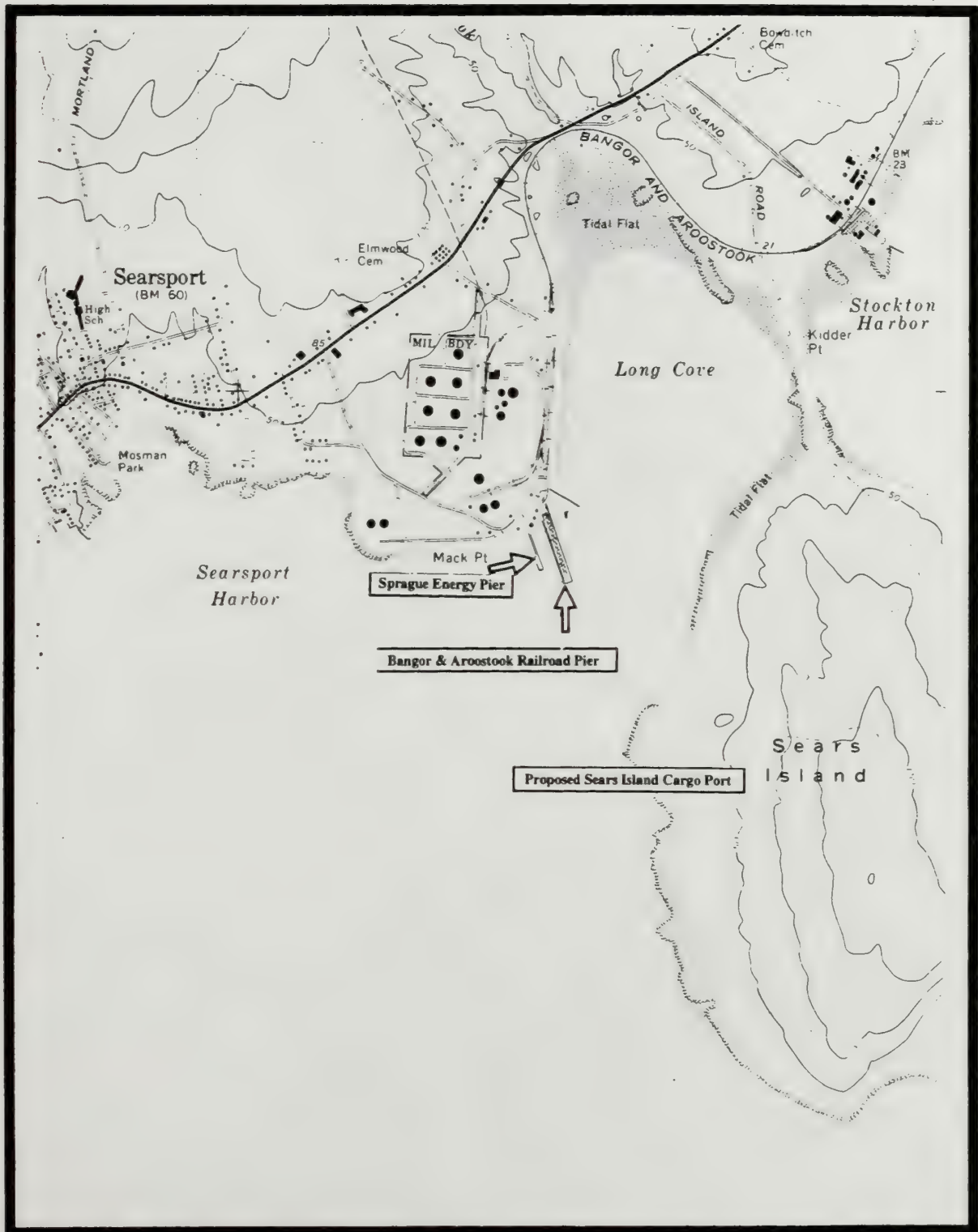


Figure 5.4 Searsport, Maine



Source: USGS Seafloor Maps

Scale in feet

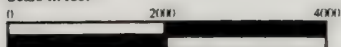
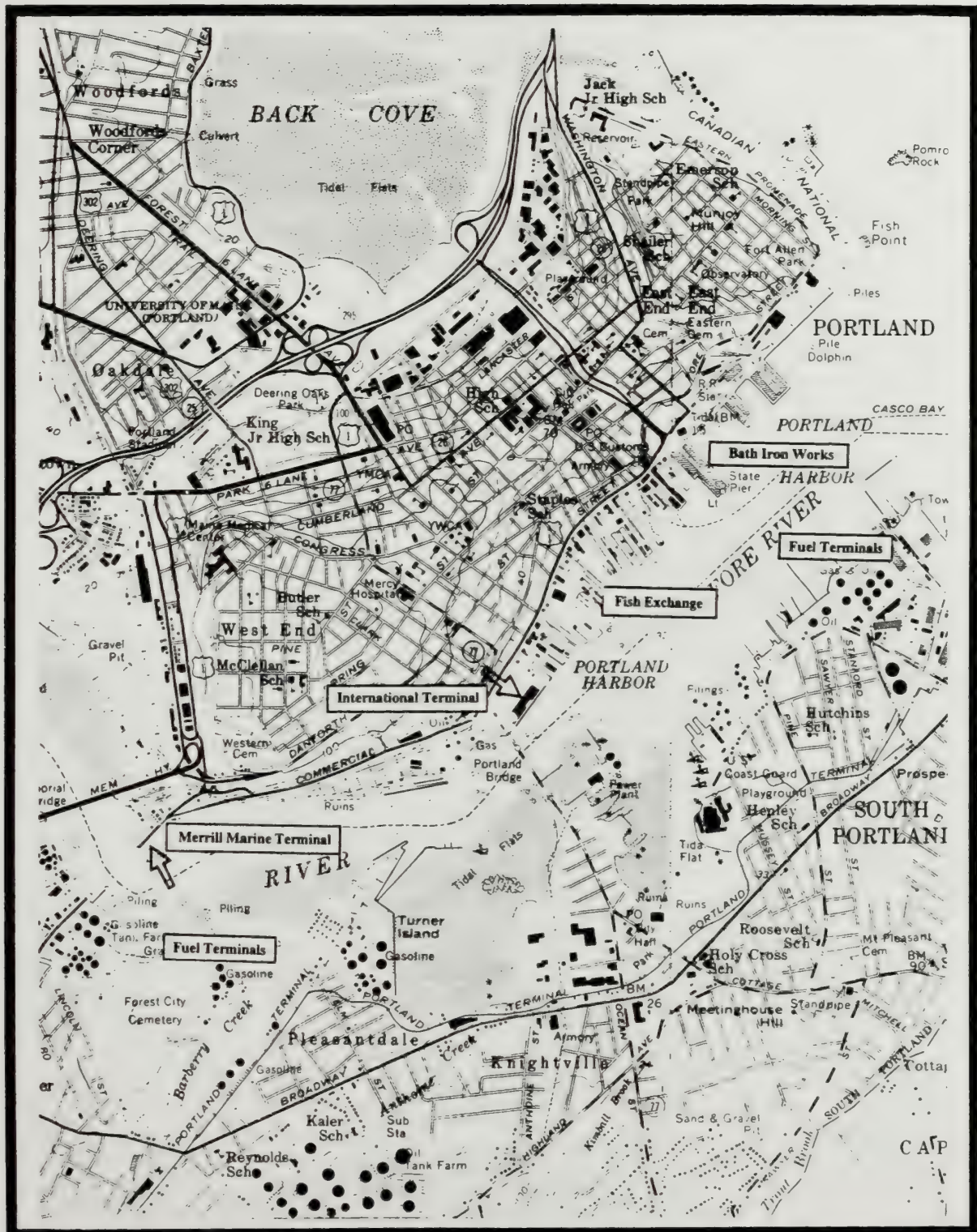


Figure 5.5 Portland, Maine



Source: USGS, Portland, Maine

Scale in feet

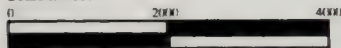
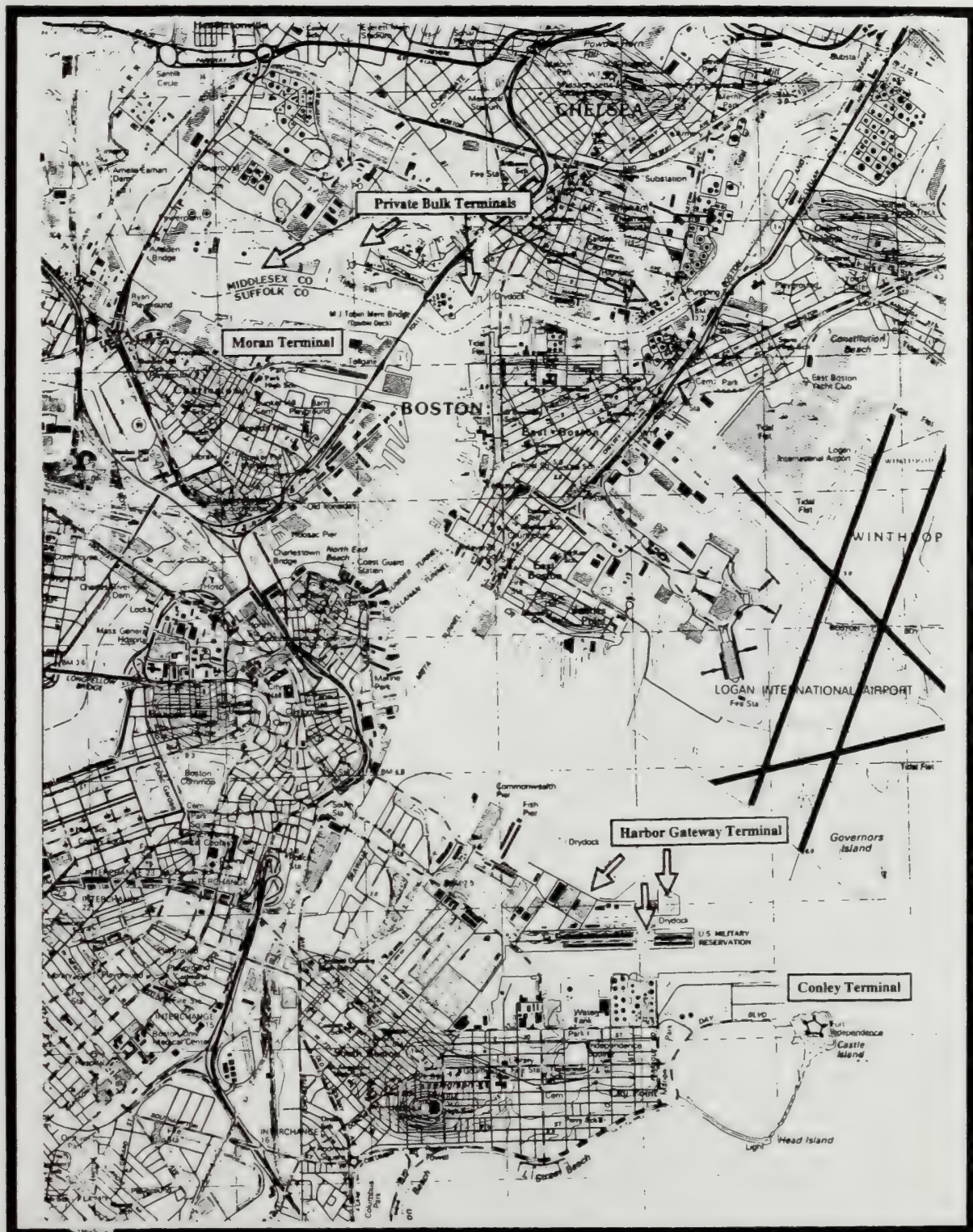


Figure 5.7 Boston, Massachusetts



Source: USGS Boston North/South Massachusetts

Scale in feet

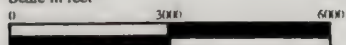


Figure 5.8 New Bedford, Massachusetts

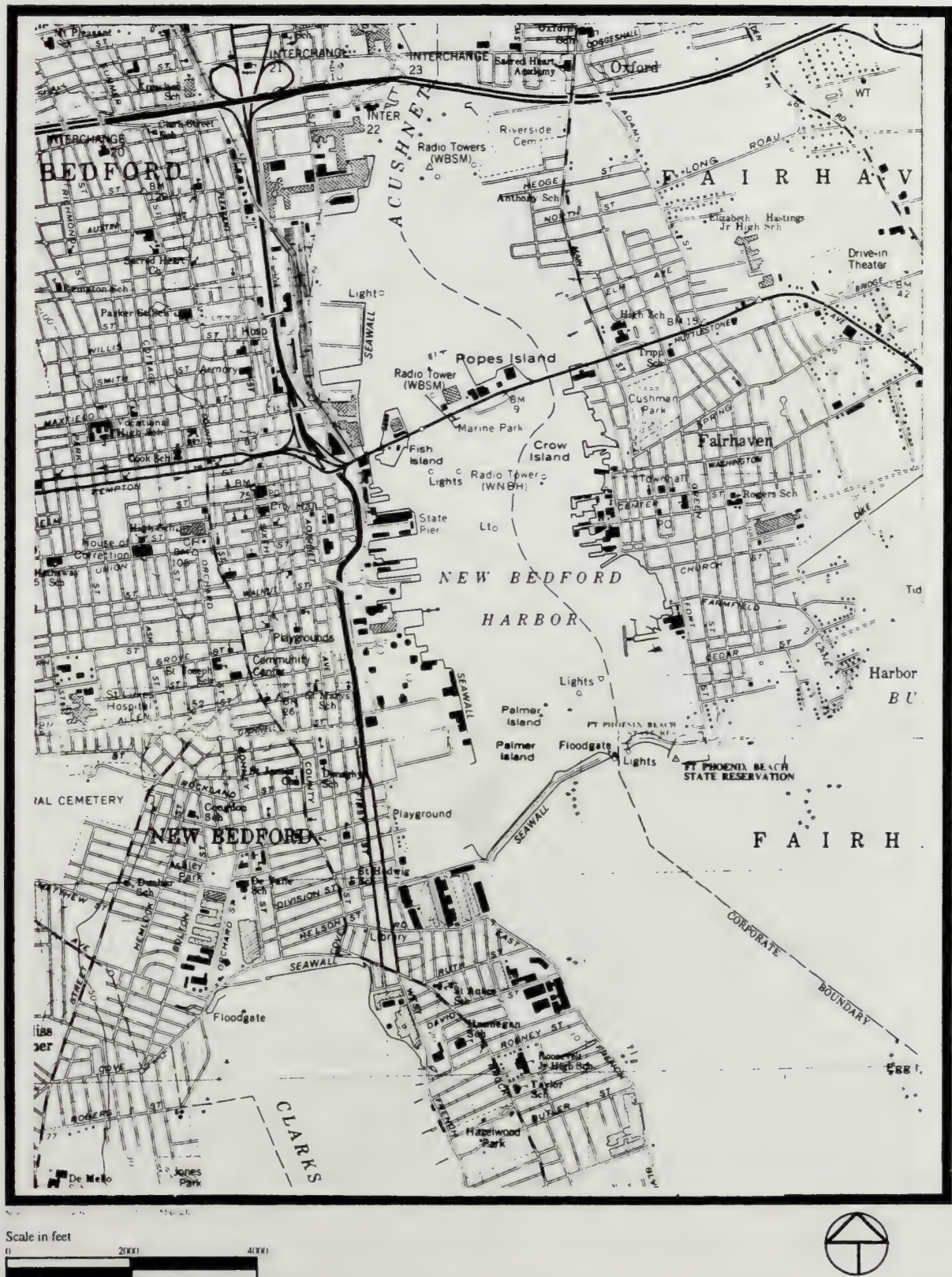




Figure 5.9 Fall River, Massachusetts





Figure 5.10 Providence, Rhode Island

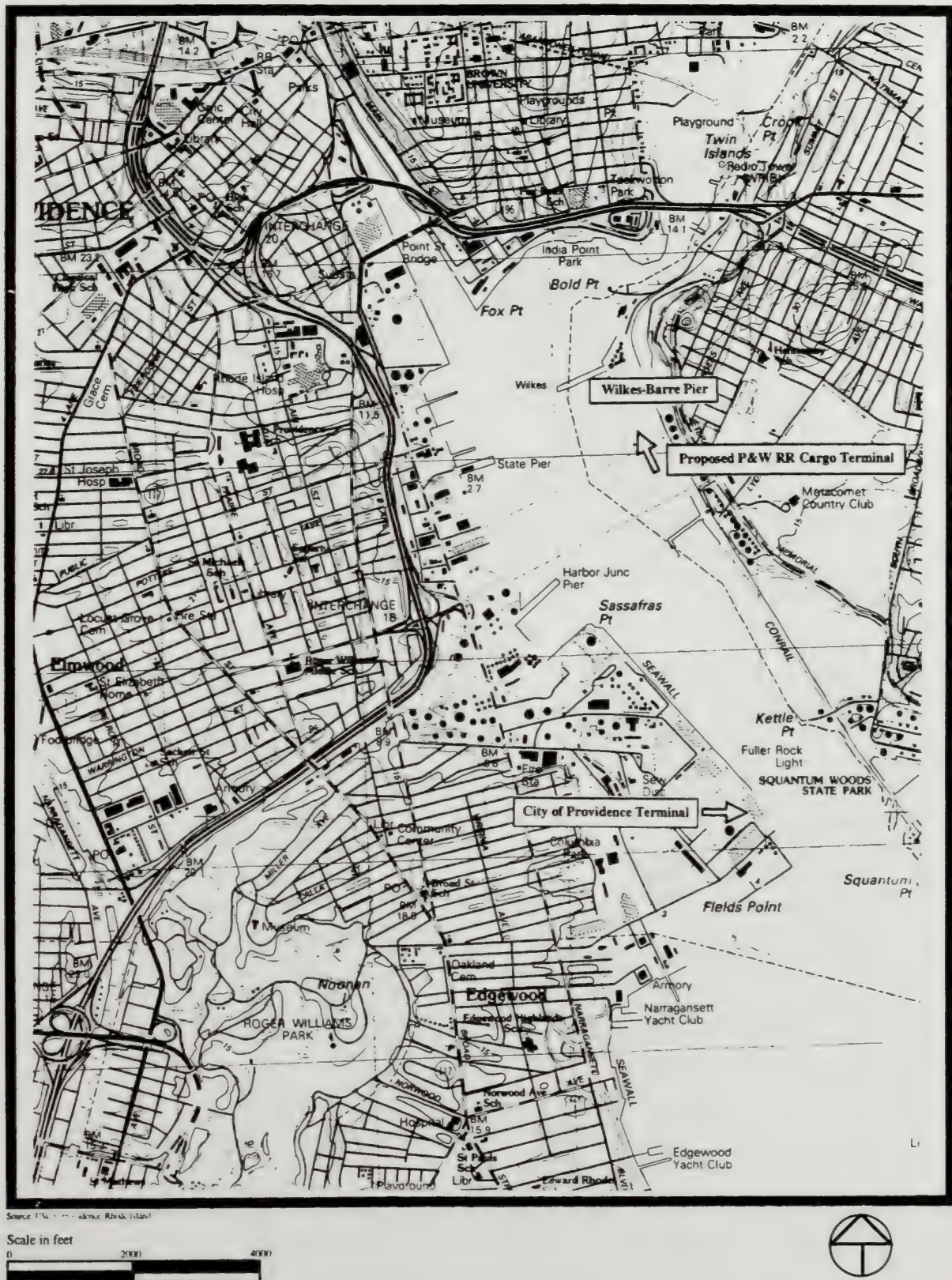
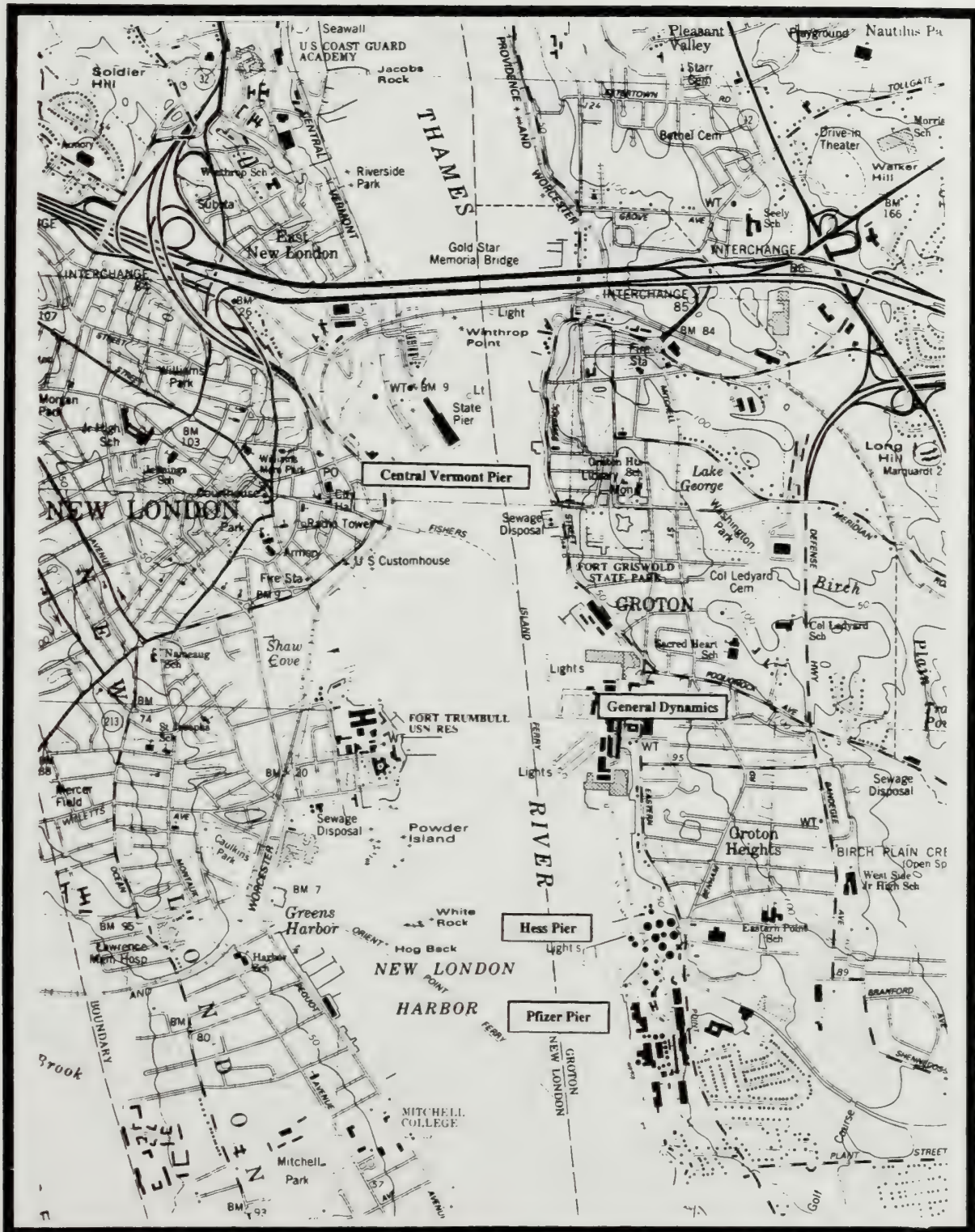




Figure 5.12 New London, Connecticut



Source: USGS, New London, Connecticut

Scale in feet

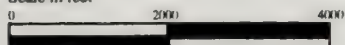
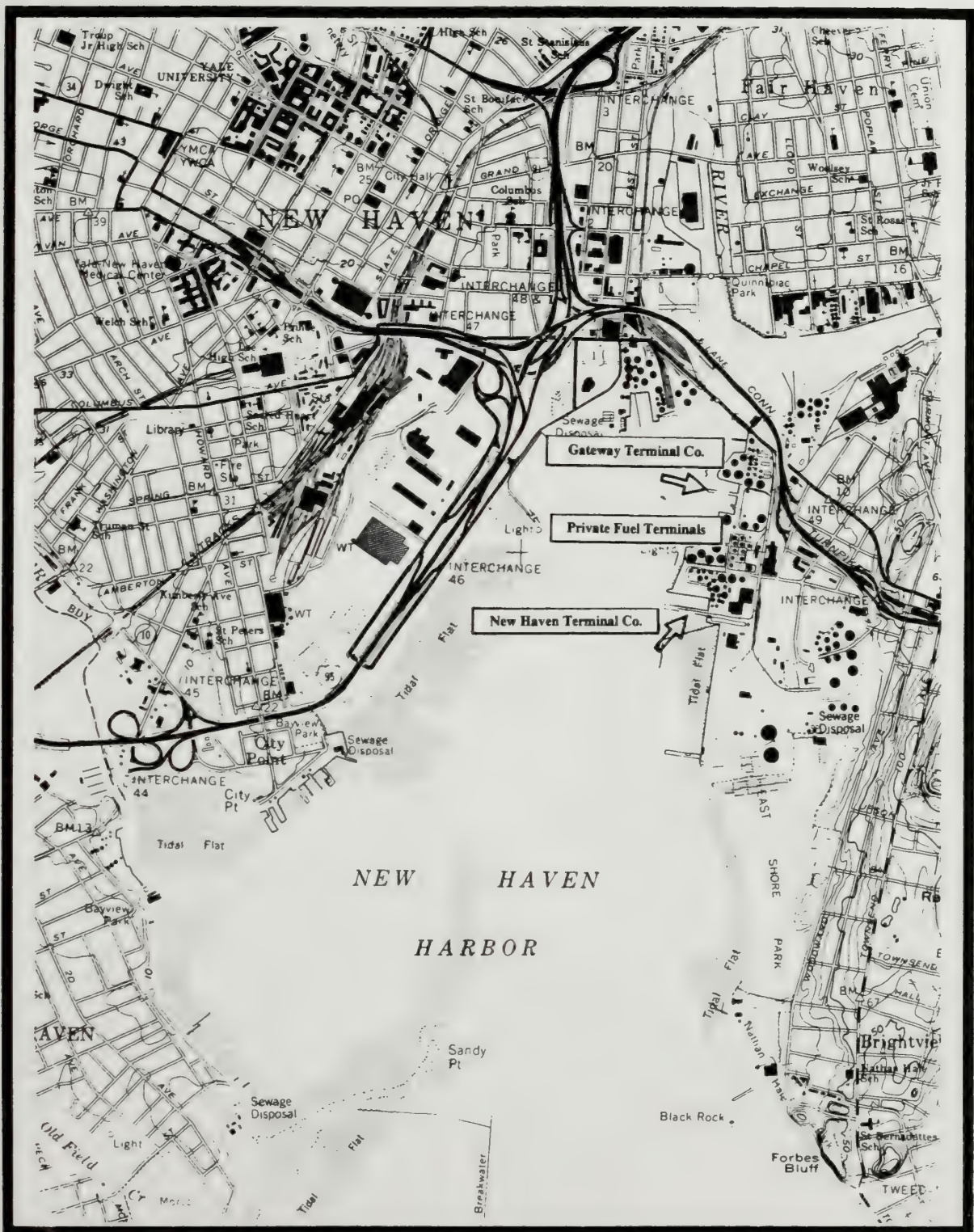


Figure 5.13 New Haven, Connecticut



Source: U.S.G.S. New Haven, Connecticut

Scale in feet

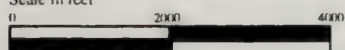


Figure 5.14 Bridgeport, Connecticut

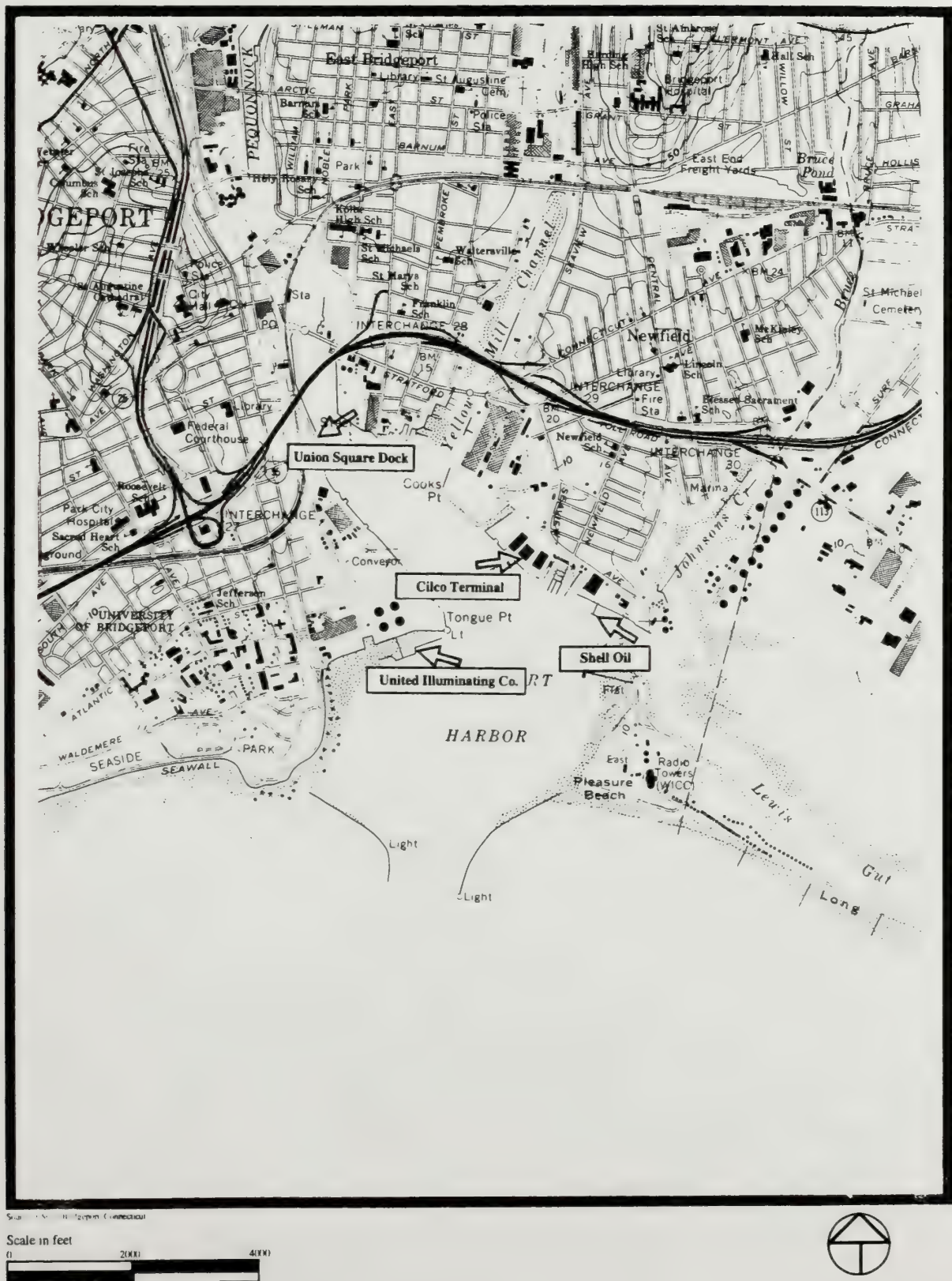


Figure 5.15 Oil Transmission Pipelines

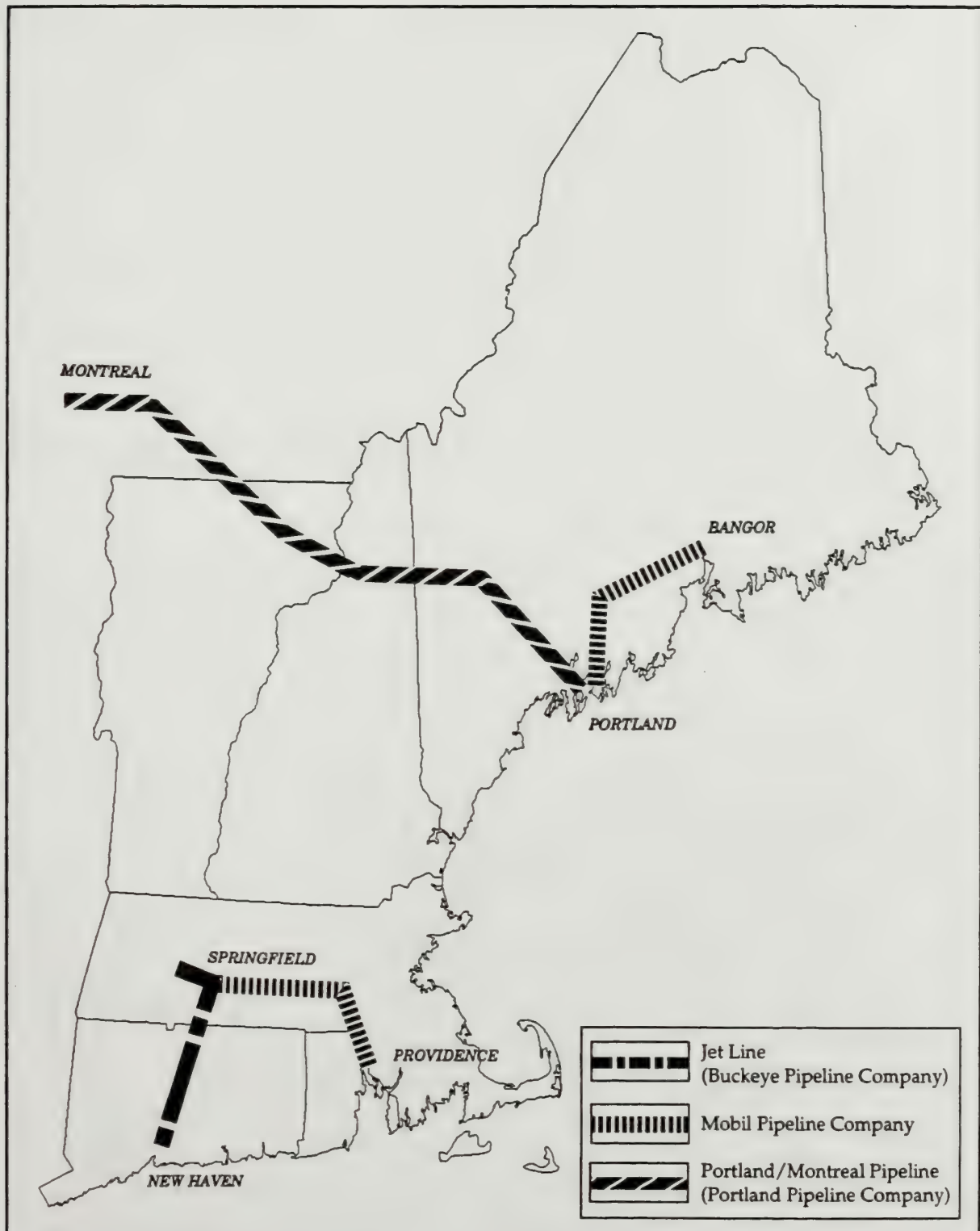
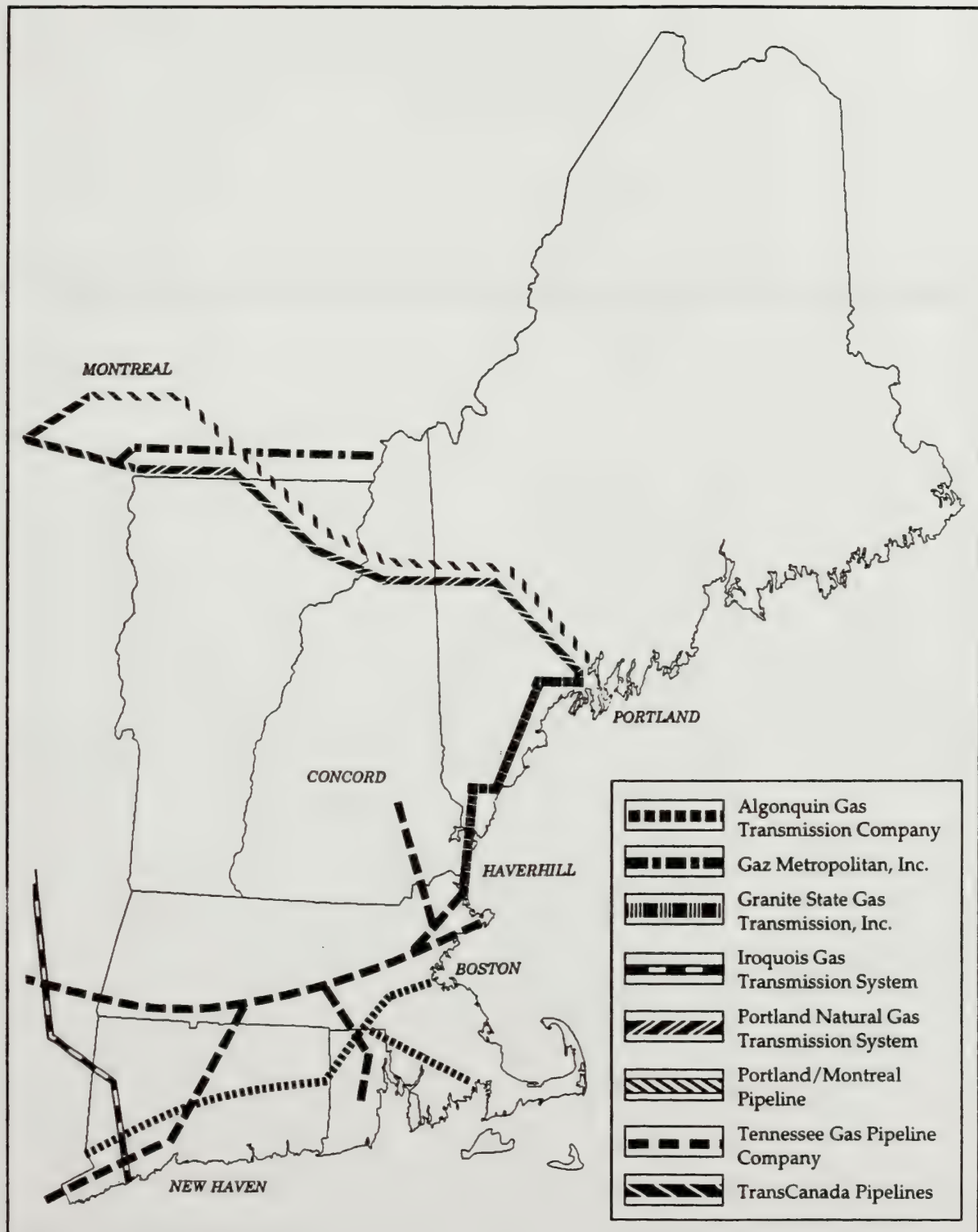


Figure 5.16 Gas Transmission Pipelines



Figures

6.0 *Telecommuting*

Chapter 6.0 – Telecommuting

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6.0 Telecommuting

■ 6.1 Key Issues/Focus

Telecommuting is the term used to define the activity of working at home or not traveling to the traditional workplace on a daily basis. The relatively recent development in telecommuting is due to the advancement of electronic communication mediums (fax machines, modems, cellular phones and voice mail) and the societal changes which compel employers to assist workers in balancing their work and family care responsibilities through flexible, and sometimes alternate, work environments.

Together with telecommuting, other worker travel routines have been recently evolving and are gaining support. With flextime, workers alter their arrival and departure time from work, but maintain the same number of daily hours in the workplace. With a compressed work schedule, workers are required to remain at work longer reducing the number of days a commuter must travel to work and, with extended work hours, shifts one end of the commute into non-peak travel periods. These worker commute options provide the potential to reduce the number of work trips generated. Staggered work hours may be the least effective variation, enabling groups of workers to arrive and leave at different times, but maintaining the normal number of work hours per day. The "staggering" effect may reduce the number of peak hour trips, but does not reduce the total number of trips made.

Not all job sectors are able to incorporate telecommuting into their workplace. For the most part, agricultural, service, and industrial workers need to be physically present to perform their job. Workers in the information sector – those jobs dealing with the development, management, and dispersion of information – are likely candidates for telecommuting. Currently, the information sector constitutes half of the jobs in the U.S.

Given the relative newness of telecommuting, limited empirical and conclusive data is available. It is estimated, however, that two million American workers telecommute periodically. Furthermore, it has been suggested that fewer than 10 percent of telecommuters report this activity so to avoid administrative problems. With the projected growth in information sector jobs and the anticipated evolution of telecommuting, as many as 15 million American workers are (10 percent of the workforce) expected to be telecommuting by the year 2003. Mobility impaired persons are one segment of the population who may find particular significant benefit from increased telecommuting options.

■ 6.2 Methodology

A review of current literature on telecommuting featured many programs which have been established and monitored throughout the country, although no specific data on New England were available. Two recent studies by the Federal government and two programs in California are discussed in the next section, providing insight into some of the impacts which may result.

■ 6.3 Existing Conditions

In January, 1990 the Federal Government instituted a pilot program called Flexiplace, which allowed selected employees from 13 agencies to work part of the week at home or at a satellite work center near their home. The aim of the Flexiplace program was to attract and retain competent employees, elevate employee quality of life, and reduce government operating costs. Over 75 percent of the participants reduced their rush-hour auto trips, exhibiting the primary transportation-related benefit of telecommuting. Furthermore, participants reported a positive impact on the quality of their personal and work lives, less sick time, and that their effectiveness in work-related interpersonal communication had not declined. A major drawback was the lack of suitable office equipment in the home. Overall, the participants judged Flexiplace to be desirable and supervisors reported no decrease in work performance. After completion of the pilot program in 1993, the Flexiplace management team recommended that Flexiplace be incorporated into all applicable government agencies.

While the Flexiplace pilot program evaluated telecommuting's effect on job performance and employee satisfaction, a report published by the U.S. Department of Transportation, "Transportation Implications of Telecommuting," addressed some of the broader implications of telecommuting. Evaluation of several programs instituted throughout the country reveal that both commute and non-commute travel decreases. Telecommuters make fewer linked trips and tend to relocate their non-work activities, such as shopping and daycare, closer to home. Telecommuting may eliminate some peak hour vehicle trips, but the decrease may encourage a latent demand for the freed available capacity from former transit and non-peak commuters. This impact is extremely difficult to quantify and is dependent upon local travel characteristics.

A new initiative, under the Federal Climate Change Action Plan, will provide telecommuting incentives to federal employees with a goal of having one to two percent of federal employees telecommuting one day per week. U.S. DOT forecasts a five-fold increase in telecommuting by the year 2000.

On a smaller scale, in 1986, the Southern California Council of Governments (SCAG) undertook a telecommuting program involving 130 employees which resulted in the

average telecommuter working at home one day out of every nine. Data show 10 percent of workers eliminated the need for 15 percent of their work trips, resulting in an average savings of 31 miles per telecommuter per day. Fourteen percent of this mileage saving was nullified by the increase in non-work trips which otherwise would have not occurred without telecommuting. SCAG did not invest in computer or telecommunications equipment for employees and provided only partial reimbursement for telephone costs.

In 1987, the State of California implemented a two-year telecommuting pilot project involving 200 employees who reduced their work trip rates by 30 percent by spending an average of 1.5 days working at home. Results indicate that no increase in non-work trips occurred while telecommuters worked at home, and further suggests that telecommuting may reduce overall household trips by creating more flexibility in scheduling.

In February 1994, Massachusetts initiated a Telecommuting Demonstration Project involving 300 employees and 18 firms. This project was included in the State's Energy Plan. A Massachusetts Telecommunications Council has been established.

For the worker, the advantages of telecommuting may include reduced travel time and cost, reduced meal costs, and increased schedule flexibility and availability to family. The worker, however, may feel isolated, be concerned with career advancement, and have a tendency to overwork. The employer may benefit from telecommuting through increased productivity, reduced overhead costs, increased employee satisfaction and reduced sick days. The disadvantages to employers may include the additional cost of telecommunicating equipment, change in management techniques and concerns over worker productivity, supervision and safety.

Beyond the issues for employer and worker, telecommuting trends may hold benefits for environmentalists who see air quality implications, transportation officials who see relevance to congestion management, and the telecommunications industry which provides the means for workers to successfully telecommunicate.

■ 6.4 Implications for Next NETI Tasks

Today telecommuting is occurring within New England, although the extent is unknown. With the concentration of high-tech and information businesses the region is a prime candidate for further telecommuting activity. High-tech businesses are also more likely to have modern communication equipment available for employees working out of the office.

Results from telecommuting programs presented above highlight the advantages which may be captured by New England. The northern New England states, with fewer urban area concentrations and more rural areas could benefit by attracting workers who would prefer to live in a rural setting but consider it infeasible with traditional commuting options. More densely populated areas of New England could benefit by realizing reduced peak hour commuter demands.

A review of 1980 and 1990 census data, while not providing telecommuting statistics, does underscore how travel-to-work patterns are changing, not only nationwide, but within the region. Nationwide, at-home workers increased from 2.3 percent to 3.0 percent of workers between 1980 and 1990. Within New England, at-home workers increased from 1.8 percent to 2.9 percent during the same period.

From the research conducted for this inventory phase of the NETI study, it became apparent that many types of travel-to-work patterns are changing throughout the country. The potential impacts for telecommuting, and further investigation into the changing work and commute patterns occurring within New England, will be undertaken in the next NETI tasks. It should also be incorporated into the "significant change" alternative scenario. The topic is one which should become the focus of future comprehensive study for the New England Region. Such a study may include the following steps:

1. **Data collection.** An extensive survey of both public and private businesses would need to be conducted to evaluate local existing telecommuting activity.
2. **Data analysis.** With an evaluation of existing telecommuting activity, both formal and informal, the features of successful programs would emerge.
3. **Select a specific business for target study.** For instance, high-tech businesses which are located throughout the region and conduct information sector work may be prime candidates for initiation of formal work-at-home programs and satellite work places.
4. **Program development.** An outline for a voluntary telecommuting program would be developed for the specific business.
5. **Program evaluation.** On-going evaluation of the impacts of the telecommuting activity would be conducted.

The results of such a study would provide regional data on the drawbacks and benefits of telecommuting, not only to employers and employees, but to society and the environment.

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Part II. Economics

7.0 *Economic Issues*

Chapter 7.0 – Economic Issues

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7.0 Economic Issues

■ 7.1 Key Issues/Focus

The main objectives of the inventory phase are to collect and review basic economic data about the New England economy. This included:

- Obtaining recent reports about the economy of the region and its constituent states;
- Interviewing officials, representatives of groups and others who are knowledgeable about the economy of their state, area or industry;
- Determining some of the key changes that have and will affect the economy of the region; and
- Identifying some of the most important economic changes that will affect future transportation needs in the region.

The results of this work are summarized in this memorandum and in the attached appendices.

Some of the specific data that is provided includes:

- Information about the location of population and employment in relation to the regional transportation network is presented, as well as other major attractions/generators of passenger and freight flows, such as tourist destinations, agricultural areas and centers of heavy manufacturing;
- The current and projected economic structure of the New England economy and each of its six states;
- Trends in major economic sectors, including comparative growth rates among economic sectors and between economic growth in New England and in the nation; and
- International trade between New England and other nations, and by major types of commodities.

The economy of New England is becoming more specialized in services, high technology and commercial activities and less specialized in manufacturing. The overall moderate rate of growth of the economy reflects the balance between some sectors that are growing rapidly and others that are declining. Employment is increasing in sectors such as high technology, health, education and professional services, but employment is declining in

other sectors, such as manufacturing, especially in primary metal, fabricated metal, textiles, apparel and leather.

Many circumstances contributed to the slowdown of the economy's growth from the "boom" period experienced during much of the decade of the 1980s. These include cutbacks in defense spending, maturing of the computer industry, restructuring of large companies and increasing competition from producers located in other regions of the United States and the world. Overbuilding resulted in oversupply of office and commercial property which led to reduced demand for new buildings which caused a slowdown in the construction sector.

The current outlook is for the economy of the region to recover from the 1989-1993 recession and to continue growing. In the longer term, there will be new opportunities for businesses in the region to expand by taking advantage of new markets that will open up as a result of the U.S.-Canada Free Trade Agreement, the North American Free Trade Agreement (NAFTA), and the new round of the GATT Agreement. Expansion of the European Common Market offers potential opportunities for sales to larger markets. A new generation of high technology industries is emerging in New England which will supplant maturing industries, such as some sectors of the computer industry. New industries that are expected to grow rapidly include biotechnology, communications, and computer software. Complementing these growing activities will be the continued expansion of tourism and specialized professional, business, health and educational services.

The changes occurring in New England's economy make it difficult to reliably forecast its future rate of growth. To a large extent, this will depend on how well New England's businesses take advantage of the new opportunities. Conservatively, it is estimated that the region's economic growth will be slower than in the nation as a whole, especially during the next few years. Improved transportation infrastructure and efficient service both within New England and linking the region's businesses with national and international markets can play an important role in accelerating the growth of the region's economy over the longer term.

■ 7.2 Methodology

Data that has been collected includes the following:

- **General Information about Trends in the New England Economy**

This information includes studies by the Bank of Boston, such as "A Guide to the Region's Economy," the New England Regional Commission's report, "The New England Regional Plan and Economic Development Strategy," and other reports by the New England Economic Project (NEEP), Boston Federal Reserve Bank and other sources. For historical data, studies have been reviewed such as, Harris' "The

Economics of New England" and The National Planning Association's "The Economic State of New England." Several of these are listed in the Appendix. These reports provide a general perspective on past and future economic trends in New England.

- **Detailed Statistics**

Basic information about the historical trends in population and employment in the New England states and its metropolitan areas has been collected from the U.S. Bureau of Labor Statistics and the New England database, which is maintained by the Federal Reserve Bank of Boston.

Information about the current structure of employment by county has been obtained from the U.S. Census's, "County Business Patterns." This source provides current information for counties and for states.

- **Forecasts**

The basic forecasts of population for New England, its constituent states and metropolitan areas is from the New England Economic Project (NEEP), which includes forecasts through 2007.

Forecasts of population and employment by major sector for the period 1973 to 2020 have been compiled for all of the counties in New England from data provided by the U.S. Department of Commerce's Bureau of Economic Analysis (BEA). The maps showing the data are included at the end of the chapter.

Current data on trade flows into and out of New England has been provided by Massachusetts Institute for Social and Economic Research (MISER) and from import and export statistics of the Boston Customs District.

During the inventory phase, we interviewed officials of the six New England states. Included were demographers, economic development staff, tourism and planning staff to identify:

- "Official" state projections of population,
- State economic forecasts,
- Major generators/attractors of freight and passengers, such as large manufacturing companies and key tourist destinations.

In addition, we have interviewed members of business associations, representatives of environmental groups and others knowledgeable about the New England economy. A list of the key people contacted is provided at the conclusion to this chapter.

■ 7.3 Historic, Existing and Forecast Conditions

This section reviews the long-term trends and projections of the New England economy. It compares trends in New England as a whole with those in the United States as a whole. The purpose of this discussion is to put current trends in New England in perspective.

7.3.1 Overview of Long-Term Trends

Over the long term, the population and economy of New England has been through many periods of rapid economic growth and sudden economic decline. The current situation of the "boom" of the 1980s and the "bust" of the 1989-1992/1993 period is not an unusual event in the region's history.

In the mid-1800s the region benefitted from the expansion of international trade and fishing. During and after the Civil War, manufacturing expanded and machinery, textile and leather industries grew rapidly. The stock market crash of 1929 had a devastating effect on the region's economy and it did not begin to recover until the onset of World War II.

Following the War, and during the 1950s the region's overall economy grew even though substantial declines occurred in the remaining textile, leather and machinery industries as these relocated to the South. During the late 1950s and continuing through the 1960s, part of the decline in traditional industries was offset by expansion of the plastics and electronics sectors. During the 1970s, the computer industry and related high tech businesses expanded rapidly generating the "boom" of the 1980s. Even then, periodic crises in the oil market had a dampening effect on growth because the region is very dependent on imported oil.

7.3.2 The Recent Economic Recession in New England

Reasons for the Decline

The sharp decline in the region's economy, which began in 1989, was the result of a number of circumstances that occurred simultaneously in New England. The decline was triggered by the downturn in the national economy. In addition, the computer industry, which had been growing rapidly, approached maturity and began to slow down. Some companies did not sufficiently anticipate the shift in technology from mainframe to mini- and micro-computers. Competition increased substantially from companies located in other regions of the United States and overseas (especially from electronics producers in the Far East). Together, these factors accelerated the decline of an industry that was already facing weakened national and international demand. The restructuring of large companies, including steps to make them "lean and mean," caused additional downsizing of some of the major "institutional" companies in New England.

Defense spending cutbacks, which reflect a long-term shift in government spending from Cold War priorities to peace time priorities, is severely affecting many sectors of the New England economy. The economies of Massachusetts, Connecticut, Maine and New Hampshire are among the most dependent in the nation on defense procurement.

International competition is increasing in all businesses sectors. This is forcing companies to become more competitive, which in many cases means reducing employment. At the same time, many medium and small-sized companies face the difficult challenge of developing business in international markets.

Because the basic sectors of the region's economy declined sharply, the secondary sectors, such as real estate, construction, retail trade and some services, also declined which added to the downturn in the region's economy.

The simultaneous occurrence of these changes affected New England when the overall national economy was slowing down. This contributed to an exceptionally sharp decrease in New England's economy. The combination of causes and the severity of the downturn means that recovery has been slower than in other regions. However, it is now well underway.

Strengths of the New England Economy

The history of New England indicates that its economy is resilient. It has substantial strengths that provide it with long-term competitive advantages over many other regions. Some of the strengths include:

- A large higher education sector including technical and liberal arts colleges and universities as well as many world-renowned research centers. Hundreds of companies in the fields of computers, electronics, biomedicine, consulting, computer software, and specialized research have been established in New England by graduates of the many high quality colleges and universities.
- Entrepreneurial activity has been strong in New England for many generations and is continuing. Many new businesses are being established by graduates of local educational institutions and former employees of research centers. Assistance needed by entrepreneurs, including venture capital, legal and other specialized services, is locally available from businesses with long experience in these fields.
- Clusters of businesses that have good potential for growth have been identified in several states. These include groups of biomedical and high technology businesses. While some of these are comparatively small, assistance is being provided to help them to grow rapidly and to spin-off benefits in other sectors.
 - Growth is continuing in some well-established sectors of the economy, such as in medicine, financial services, specialized computers and software, business services, professional services and tourism.

- Growth is beginning to resume in some companies that have successfully reorganized. Some restructuring simply caused a one-time loss of jobs. As the economy recovers, many of these companies are expanding. Included are businesses that have "down-sized," reorganized, or have successfully made the transition from producing goods for defense to producing goods for commercial markets, especially in the electronics, instrument and optical fields.
- Strong, long-term international connections, especially with Europe and Canada make it easier for some New England businesses to expand internationally. These relationships are reinforced by the large numbers of foreign visitors, students and foreign travel by New Englanders. New England's banks and other institutions have had strong connections in Europe and South America for many years. These facilitate market entry and expansion of international business by New England companies.

Problems and Opportunities for the Resurgence of the New England Economy and the Importance of Transportation Infrastructure

Transportation has a critical role in the revitalization of the New England economy. It will reduce transportation/logistics costs for all sectors of the economy, helping firms to become more competitive and to reach new markets. In the context of some of the opportunities discussed above:

- A good intra-regional transportation network will specifically benefit the following sectors of the New England economy:
 - The clusters of growth industries;
 - The expansion of tourism; and
 - Other manufacturing industries, wholesale and retail business, construction and resource-based activities, such as agricultural and forestry products.
- Good transportation infrastructure and service between New England and other regions, Canada and international destinations is essential for:
 - Businesses and services to efficiently and competitively serve the growth markets in these areas. New England is farther from the most rapidly expanding regions in the United States than other locations and it needs to offset the cost and time disadvantage of this.
 - Meeting the increasingly stringent logistics requirements of customers. This means delivering goods faster, more efficiently, at specified delivery times and with increased reliability. This places new burdens on all modes of transportation and intermodal transfers.

- The high tech, service and tourism sectors towards which the New England economy is shifting are all highly dependent on fast, reliable and efficient transportation of goods and people to growing regional and world markets.

A good transportation network serving New England is essential to the successful revitalization of its economy. The region's fastest growth sectors are still comparatively small and distance to expanding markets is farther than from many other locations. Competition from other areas of the world is increasing. The region also must overcome the disadvantages of comparatively high wages, costs of living and doing business, that are the residual impacts of the boom years of the 1980s. As wages and costs decline toward the national average, the business climate will improve. Good transportation infrastructure and services can help to offset the region's disadvantages and to accelerate the recovery of the region's economy.

7.3.3 The Outlook for the Region's Economy

The preliminary outlook for New England's economy is that the recent sharp decline will end and that growth will resume over the next one to three years, depending on the state. The recent increase in employment and reductions in unemployment rates signals the end of the recession and the turn-around of the economy. A consistent moderate rate of growth is expected to be achieved by the mid-1990s. However, it will start from the lower level reached in the recession. Most of the jobs that have been lost are gone; they will not return.

Expansion of the New England economy after the mid-1990s is likely to be slower than the rate of growth of the national economy. Reasons for this include the small size of the fast growing sectors; continuing cutbacks in defense spending, which will affect a significant sector of the region's businesses; the comparatively high wages and living costs; and increasing worldwide competition, especially in the growth markets outside of New England which potentially offer opportunities for the region's companies to increase their sales.

Demographic Trends

Current

In 1990, the population of New England was 13.2 million (see Table 7.1). Massachusetts accounted for nearly half of this population (6.2 million). Connecticut was the second largest state with a population of 3.3 million. Maine, New Hampshire and Rhode Island each had about one million population. Vermont is the smallest, with 0.6 million.

Past Trends

Since 1910, the New England population has grown at an average annual rate of 0.9 percent, while increasing from 6.6 million to 13.2 million. Due to its comparatively slow growth, the region's population has decreased from 7.1 percent of the nation's population in 1910 to 5.3 percent in 1990.

Throughout most of the past 80 years, the population of all New England states has increased in almost every decade. The exceptions are Vermont, whose population declined between 1910 and 1930, and Rhode Island whose population declined between 1970 and 1980. Similarly, the economic areas in New England (as defined by the Bureau of Economic Analysis (BEA)) have experienced growth except for Providence-Pawtucket-Woonsocket, whose population declined in the same decade as Rhode Island's.

Figure 7.1 shows that the rate of population growth for the region as a whole and for northern and southern New England differs from that of the United States. During the past 80 years, New England's annual average rate of increase of has been about 0.3 percent slower than the 1.2 percent annual growth rate for the rest of the United States. Northern New England grew at a slower rate than southern New England between 1910 and 1970, but picked-up after 1970.

Future Trends

The forecasts of population to the year 2020 by BEA indicate that growth is expected to be faster in northern New England than in southern New England. Growth in southern New England is expected to be slower than the national average. Overall, the population of New England is expected to grow a little less rapidly than in the nation, at an annual average rate of about 0.3 percent compared to 0.4 percent.

The New England Economic Project (NEEP) recently has made short-term forecasts for New England. Its estimates are that the average annual growth rate will range between 0.2 and 0.4 percent through 1997.

Population Density

Figure 7.2 shows population density (persons per square mile) by county in New England and the major highway network as proposed for inclusion in the National Highway System (NHS). (Figure 7.3 shows population density and the major rail network.) The map shows that population is concentrated in counties that constitute the large metropolitan areas, including Boston, Providence, Hartford, Springfield, Worcester, Portland, Manchester, Burlington and southwestern Connecticut (Fairfield County, which includes Bridgeport and Stamford-Norwalk).

The forecasted change in population density during the 1990 to 2020 period is shown in Figure 7.4. It indicates that the largest increases in population density will occur in counties in or near the large metropolitan areas. Between 1990 and 2020, counties in eastern Massachusetts, southwestern Connecticut, and those bordering Providence will increase in density by 900 or more persons per square mile. A pattern of suburbanization and decentralization will continue to occur rather than the emergence of major new concentrations of population in satellite areas. Therefore, a challenge in transportation planning will be to provide needed transportation infrastructure and service in the current population corridors, in their more rapidly growing suburban areas, as well as extending improved infrastructure to more rural areas of New England.

Employment Trends

Current

In 1990, the total number of jobs in New England was 8.2 million, according to BEA. The service sector accounted for 38 percent of employment, trade for 22 percent, manufacturing for 17 percent, government for 12 percent, and all other sectors for 11 percent (see Table 7.2). This composition of employment is similar for all New England states (see Figure 7.5) and for the nation. At a more detailed level there are significant differences in employment.

Massachusetts accounts for the largest proportion of New England employment followed by Connecticut, Maine, New Hampshire, Rhode Island and Vermont.

Past Trends and Forecasts

According to the Bureau of Economic Analysis (BEA), total employment in New England increased from 5.4 million in 1970 to 8.2 million in 1990 (Table 7.2), which is at an average annual rate of 2.1 percent. Between 1990 and 2020, it is only expected to increase to 9.2 million, which is at an average annual rate of 0.3 to 0.4 percent. In other words, the annual average rate of growth is expected to decrease to one-fourth the rate experienced during the past two decades. Compared with the nation, New England's employment is expected to grow about one-third slower.

The future trend in employment by sector is shown in Figure 7.6. It indicates that total employment will peak in about the year 2020. Figure 7.7 shows that the fastest growth will be in trade and services and the slowest will be in manufacturing and construction. The change in composition of employment is shown in Figure 7.8. It indicates that manufacturing will decrease from 17 to 14 percent of total employment. According to the New England Economic Project (NEEP), New England is expected to lose 23,000 more manufacturing jobs between 1993 and 1997. About three-fourths of this loss is expected to occur in Connecticut. Services and trade will increase from 60 to nearly 65 percent of total employment in the region.

Trends and forecasts of employment by state are shown in Figure 7.9. It indicates that long-term trends in Massachusetts and Connecticut are similar and that the northern states will grow a little faster than the southern New England states.

In the short term, however, studies indicate that Connecticut and Rhode Island will have very sluggish economies, partly due to continuing cutbacks in defense spending. Massachusetts and New Hampshire, which were very hard hit in the recent recession, will recover slowly and Maine and Vermont's growth will be similar to the nation's.

Employment Density

The pattern of employment density shown in Figure 7.10 is very similar to that of population shown in Figure 7.2. It is heavily concentrated in the major metropolitan areas including Portland, Boston, Providence, Worcester, Springfield, Hartford, New Haven and southwestern Connecticut, with some in satellite centers, such as in Burlington and Pittsfield. Most of these areas are in major highway and rail corridors.

The change in employment density reflects suburbanization and some decentralization of employment. However, Figure 7.11, which shows the absolute change in employment by county, indicates that there will be significant employment increases in central Maine (Lewiston and Bangor), central New Hampshire, western Massachusetts and western Connecticut. This is a much more diverse pattern than revealed by change in density.

Employment in Sectors that are Closely Related to the Generation of Freight

Trends and forecasts of employment in some of the economic sectors that are closely related to the generation of freight are shown in Table 7.3. It indicates that during the 1990 to 2007 period, overall employment in manufacturing will decrease by more than five percent. Some of the manufacturing sectors generating freight movements will expand. These include lumber, furniture, non-electric machinery and printing. However, other manufacturing sectors will decline, including primary metals; stone, clay and glass; electrical machinery, food, paper and petroleum products. The construction sector is expected to experience a small increase. However, the largest increase will be in wholesale trade, which is expected to expand by more than 25 percent.

Figure 7.12 shows the counties in which companies employing more than 1,000 employees are located. Those engaged in manufacturing, trucking and wholesale are likely to generate substantial freight movements. While most are located in the New England industrial belt, a significant number are in rural areas, especially pulp and paper companies.

Per Capita Income

Personal income per person (per capita income) in New England is expected to continue to be higher than the national average. In 1990, per capita income in New England was \$16,523 which was nearly 22 percent above the national average of \$13,595. (See Table 7.4.)

During the boom period of the 1970s and 1980s, per capita income in New England increased more rapidly than the national average. However, the recent recession has slowed down its rate of growth. Over the long term, per capita income in New England is expected to decrease, approaching the national average by 2020.

7.3.4 Special Topics

Defense Spending

In 1992, spending by the Department of Defense (DoD) accounted for nearly eight percent of the gross state product in Maine; about four percent in Massachusetts, Rhode Island and Connecticut, about two percent in New Hampshire and about one percent in Vermont (see Figure 7.13). The Maine economy is especially dependent on the Bath Iron Works shipyards in Bath and Portland, as well as spin-offs from the submarine facility in Portsmouth/Kittery. These yards are subject to cutbacks as the Navy lengthens its procurement periods for new ships and for retrofitting older ones.

Defense procurement affects several types of businesses in Connecticut. The aviation-related companies, such as United Technologies (including Pratt & Whitney) and their suppliers produce military aircraft engines and helicopters. Spending for these is being reduced. Electronic instruments including control and guidance for military aircraft and other applications are produced by Norden and other companies. Department of Defense contract awards will decrease less in these sectors than in military hardware (such as ships and aircraft). Electric Boat Company in Groton employs more than 10,000 workers producing Trident and other submarines. It has survived recent threats of closing but is likely to experience cutbacks in (DoD) spending resulting from the stretching-out of contracts. This facility employs many people living in southwestern Rhode Island so cutbacks will affect that state's economy as well. Rhode Island may also experience some cutbacks at remaining naval facilities at Quonset Point and Newport. Massachusetts and Connecticut mainly produce electronics equipment and sophisticated weapons, as well as some aircraft and other components. Defense cutbacks are likely to be slower and less severe in these sectors. There are likely to be more opportunities for conversion from producing high tech military equipment to manufacturing commercial products.

Defense contract awards in the United States and New England are shown in Table 7.5. It indicates that annual contract awards increased from about \$3 billion in 1970 to \$7 billion in 1978, and were between \$14 and \$16 billion between 1984 and 1990. During this period, New England's share increased from about eight percent of national awards to a peak of nearly 14 percent in 1989. Substantial cuts in DoD spending, returning to the level of the early 1970s and a slightly decreasing share of national DoD procurement would result in a two to three percent reduction in gross state product in Connecticut, Massachusetts and Rhode Island and a larger reduction in Maine. Just since 1989, defense contract awards in New England have decreased by about one-third.

Foreign Trade

Trends in exports and imports through the Boston Region Customs District are shown in Table 7.6 for the 1965 to 1991 period. The value of the District's exports increased approximately four times between 1970 and 1980, and two and one half times between 1980 and 1991. Imports followed a similar pattern. Over the whole 1970 to 1991 period, exports increased by about eight times and imports by about 10 times.

The District's share of national exports has decreased slightly, from about nine percent in 1970 to about eight percent in 1991. Imports have decreased more, from about 14 percent of the nation's in 1970 to 10 percent in 1991.

The fact that New England has not maintained its share of the nation's exports suggests that additional efforts may be required to help businesses to expand their international sales. A recent study by the Bank of Boston indicated that exports accounted for less than five percent of the gross state product of Rhode Island, New Hampshire and Maine. In Connecticut and Massachusetts exports accounted for between six and eight percent. Vermont has taken advantage of the opportunity to increase its international business with Canada. Exports account for more than 20 percent of its gross state product.

The destination of exports from New England are shown in Table 7.7. It indicates that by value, more than half of the exports are destined for Europe and most of the remainder is for Canada. The principal goods exported from New England are shown in Table 7.8. These are electronic equipment, and industrial machinery (mostly computers) which account for more than 45 percent of the region's exports. Other smaller sectors include instruments, transportation equipment (mostly aircraft engines and components), chemicals and related products and fabricated metal products. These account for 33 percent of the region's exports. Together with electronic equipment, the two groups account for 78 percent of the region's exports.

Tourism

Tourism and recreation has been a long-term growth sector of New England's economy. One indicator is that employment in hotels more than doubled between 1970 and 1990 and is expected to increase by about 50 percent during the next 15 years (see Figure 7.14.) Because of reductions in hotel/motel staffing that have occurred, especially in the low-cost motels, it is very likely that tourism has increased much faster than the growth in hotel/motel employment indicates.

The total annual number of visits to New England is approximately 100.4 million as shown in Table 7.9. Because each state defines these "visits" differently, it is difficult to compare levels of tourist activity by state. Maine and Vermont both attract approximately eight million "overnight" visitors, while Connecticut's 8.1 million visits include only attendance at major attractions. Visitation in Massachusetts, New Hampshire, and Rhode Island, which includes day trippers, is estimated at approximately 25 million annual visits per state. Cape Cod alone attracts two million visitors each year.

The number of visitors to beaches, museums, conventions, festivals and major entertainment is very large. Because of the seasonal nature of recreation and specific locations of attractions, special demands are placed on transportation infrastructure serving these areas, especially at peak times.

Trade and Services

Trade and services are expected to account for most of the growth in employment in New England between 1990 and 2010. Together, these two sectors will expand by nearly 23 percent, adding more than 1.1 million jobs. The total growth in all sectors of the New England economy is expected to be about 14 percent and to add a net total of about 1.2 million jobs.

The trade sector includes both wholesale and retail trade. It is expected to grow by more than 17 percent. This will generate substantial new demand for the transportation of goods in the region. Included are food and other consumable products sold in supermarkets, home furnishings and other merchandise sold in department stores, and goods sold in other specialized retail stores, as well as a wide range of industrial and other products (such as motors, parts, building materials and consumables such as paper goods) handled by wholesalers and distributors. Many of these goods will be coming from suppliers located in other regions of the United States and from other nations. This will place increasing demands on long-haul rail (especially container), air and truck transportation.

Within the region, most of the goods will be handled by truck, such as delivering goods from ports and rail terminals to warehouses, and from warehouses to retail stores, shopping malls and directly to businesses.

Employment in the service sector is expected to increase by more than 26 percent between 1990 and 2010. The service sector includes business services (such as advertising), professional services (such as legal), financial services (such as banking), and institutional services (such as hospitals, colleges and universities). The service sector also includes research and development, computer software and some biotechnology activities which support the expansion of several of the key growth "clusters" of related industries that will lead the way to the economic resurgence of New England. The changing economic structure will result in a shift from heavy, manufactured goods to smaller, lighter components and semi-finished and other products.

Although these activities do not directly generate as large a volume of freight shipments per employee as manufacturing, wholesale/distribution and retail activities, they do generate a large number of pick-up and delivery truck trips. Companies which serve the needs of this market, such as UPS, Federal Express and DIIL, handle many of the small packages that must be expeditiously delivered within the region as well as to other areas of the United States and to foreign countries.

The service sector also generates a large proportion of the demand for business travel. Professional and business services depend to a large extent on face-to-face contact. Colleges and universities attract students and large, highly specialized hospitals attract patients from other regions and nations, many of whom travel by air. In addition, educational institutions and hospitals require large amounts of consumable products that are shipped into the region on a variety of transportation modes. Both require large amounts of food for their kitchens. Hospitals also use large amounts of disposable plastic, paper and other supplies.

The rapid growth in New England's trade and service sectors will generate increasing demand for the transportation of freight into, within, and outside of the region. These sectors also will generate increasing numbers of business travellers. Good, fast transportation service by airplane (to and from national and international markets), rail (to and from the Middle Atlantic states and other regions), and by truck and by automobile within the region and surrounding areas, is essential to the growth of these sectors of the economy.

Summary

The economy of New England is recovering from the recent recession. During the next sixteen years, the region's rate of growth is expected to be slower than that of the United States of whole, partly because of the restructuring that the region's economy is undergoing. However, there are many opportunities for faster growth. A good, efficient, multimodal transportation network handling both freight and passengers (business and tourists) will play an important role in helping businesses to become more competitive, to reach new markets and to achieve a faster rate of growth. Increases in the productivity of workers, more use of components purchased from suppliers located outside of the region and the growth in international trade will continue to generate faster growth for freight and passenger traffic than is indicated by the increase in employment in New England.

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Tables

Table 7.1 Population — Historic Trends and Forecasts (in thousands)

	Historic									Forecast			
	1910	1920	1930	1940	1950	1960	1970	1980	1990	2000	2010	2020	2040
United States	92,228	106,022	123,203	132,165	151,326	179,323	203,302	226,505	248,710	267,741	282,050	293,839	301,282
New England	6,553	7,401	8,166	8,437	9,314	10,509	11,848	12,348	13,207	14,066	14,832	15,409	15,743
Northern New England	1,529	1,563	1,612	1,698	1,825	1,966	2,177	2,557	2,900	3,163	3,363	3,496	3,575
Southern New England	5,024	5,837	6,544	6,739	7,490	8,543	9,671	9,792	10,306	10,903	11,469	11,913	12,168
Connecticut	1,115	1,381	1,607	1,709	2,007	2,535	3,032	3,108	3,287	3,489	3,666	3,803	3,877
Maine	742	768	797	847	914	969	994	1,125	1,228	1,308	1,377	1,430	1,460
Massachusetts	3,366	3,852	4,250	4,317	4,691	5,149	5,689	5,737	6,016	6,342	6,674	6,931	7,079
New Hampshire	431	443	465	492	533	607	738	921	1,109	1,240	1,334	1,392	1,430
Rhode Island	543	604	687	713	792	859	950	947	1,003	1,072	1,129	1,179	1,212
Vermont	356	352	350	359	378	390	445	511	563	615	652	674	685
BEA Economic Areas:													
Bangor, ME	NA	NA	NA	NA	NA	NA	329	354	362	381	396	409	416
Portland-Lewiston, ME	NA	NA	NA	NA	NA	NA	678	774	862	928	980	1,020	1,044
Burlington, VT	NA	NA	NA	NA	NA	NA	511	573	641	697	739	764	777
Boston, MA	NA	NA	NA	NA	NA	NA	5,560	5,675	6,051	6,486	6,856	7,130	7,295
Providence-Pawtucket- Woonsocket, RI	NA	NA	NA	NA	NA	NA	989	957	1,006	1,072	1,129	1,179	1,212
Hartford-New Haven- Springfield, CT-MA	NA	NA	NA	NA	NA	NA	3,174	3,192	3,372	3,588	3,771	3,911	3,987

Source: U.S. Bureau of the Census, Cambridge Systematics' estimates, and Bureau of Economic Analysis (BEA), Regional Projections to 2040.

**Table 7.2 New England Employment
Historic Trends and Forecasts (thousands of jobs)**

	Historic			Forecast			
	1970	1980	1990	1995	2000	2010	2040
Total Employment	5,365.3	6,459.5	8,195.7	8,621.1	9,015.8	9,377.6	8,815.2
Farm	56.8	63.1	51.0	49.3	47.9	44.8	35.6
Agriculture, forestry, fisheries *	34.7	47.4	82.8	94.7	104.7	116.5	118.8
Mining	4.0	5.8	7.8	8.0	8.3	8.4	7.6
Construction	306.6	274.0	478.4	481.5	486.9	483.4	425.5
Manufacturing	1,376.4	1,547.3	1,388.6	1,368.3	1,359.6	1,324.3	1,140.3
Transportation and public utilities	246.3	262.1	323.0	340.3	355.0	367.5	344.2
Trade	1,079.2	1,345.2	1,776.0	1,882.5	1,984.6	2,085.3	1,983.9
Finance, insurance, and real estate	315.5	427.0	664.4	701.1	736.4	772.6	737.2
Services	1,069.0	1,567.7	2,424.9	2,676.7	2,890.6	3,122.8	3,062.9
Government	877.0	919.8	998.9	1,018.9	1,041.8	1,052.1	959.4

Source: Bureau of Economic Analysis (BEA), Regional Projections to 2040 and Cambridge Systematics estimates.

Table 7.3 Sectoral Employment Generating Freight Movement – 1973, 1990, 2007
New England States

Industry	1973	1990	2007	Abs. Change 73-90	% Change 73-90	Abs. Change 90-07	% Change 90-07
Total Manufacturing	1,419,240	1,222,840	1,160,070	(196,400)	-13.8%	(62,770)	-5.1%
Lumber	31,290	26,590	27,990	(4,700)	-15.0%	1,400	5.3%
Furniture	22,720	14,540	16,190	(8,180)	-36.0%	1,650	11.3%
Stone, Clay, Etc.	30,190	22,880	22,180	(7,310)	-24.2%	(700)	-3.1%
Primary Metals	52,760	31,570	28,980	(21,190)	-40.2%	(2,590)	-8.2%
Fabricated Metal	145,060	99,180	97,290	(45,880)	-31.6%	(1,890)	-1.9%
Non-Elec. Machine	160,670	167,130	173,640	6,460	4.0%	6,510	3.9%
Elect. Equipment	184,170	179,090	173,850	(5,080)	-2.8%	(5,240)	-2.9%
Motor Vehicles and Equip	10,140	5,260	6,840	(4,880)	-48.1%	1,580	30.0%
(remainder) Trans. Equip	95,170	130,850	100,550	35,680	37.5%	(30,300)	-23.2%
Instruments	62,840	87,950	82,620	25,110	40.0%	(5,330)	-6.1%
Misc. Manufacturing	73,460	57,290	44,320	(16,170)	-22.0%	(12,970)	-22.6%
Food	66,980	46,950	35,860	(20,030)	-29.9%	(11,090)	-23.6%
Tobacco Manuf.	450	420	240	(30)	-6.7%	(180)	-42.9%
Textiles	79,130	35,020	24,390	(44,110)	-55.7%	(10,630)	-30.4%
Apparel	71,370	31,280	24,530	(40,090)	-56.2%	(6,750)	-21.6%
Paper	72,100	58,690	55,240	(13,410)	-18.6%	(3,450)	-5.9%
Printing	78,280	105,260	114,320	26,980	34.5%	9,060	8.6%
Chemicals	39,870	45,710	42,010	5,840	14.6%	(3,700)	-8.1%
Petroleum Products	2,060	2,030	1,660	(30)	-1.5%	(370)	-18.2%
Rubber	75,380	51,760	69,020	(23,620)	-31.3%	17,260	33.3%
Leather	65,150	23,390	18,350	(41,760)	-64.1%	(5,040)	-21.5%
Total Construction	232,750	255,280	263,700	22,530	9.7%	8,420	3.3%
Total Trans., Comm., & Util.	233,680	270,300	266,840	36,620	15.7%	(3,460)	-1.3%
Railroad	13,890	5,370	4,260	(8,520)	-61.3%	(1,110)	-20.7%
Trucking	58,460	65,050	73,110	6,590	11.3%	8,060	12.4%
Local/Interurban	24,780	35,870	31,970	11,090	44.8%	(3,900)	-10.9%
Air Transport.	9,900	20,040	19,940	10,140	102.4%	(100)	-0.5%
(remainder) Trans.	12,040	25,860	30,450	13,820	114.8%	4,590	17.7%
Communication	73,150	66,100	55,340	(7,050)	-9.6%	(10,760)	-16.3%
Public Utilities	41,460	52,010	51,770	10,550	25.4%	(240)	-0.5%
Total Wholesale	22,873	33,765	42,356	10,892	47.6%	8,591	25.4%

Source: NEPLAN, The NEPOOL Economic and Demographic Forecast. New England and the Six States. April 1992.

Table 7.4 Per Capita Personal Income – Constant 1982 Dollars

	Historic			Forecast			
	1970	1980	1990	2000	2010	2020	2040
United States	9,897	11,559	13,595	15,345	16,693	17,721	20,646
New England	10,551	12,102	16,523	18,154	19,405	20,421	23,530
Connecticut	11,824	13,837	18,821	20,503	21,793	22,758	25,966
Maine	8,281	9,457	12,434	14,014	15,272	16,292	19,105
Massachusetts	10,794	12,207	17,057	18,694	19,934	20,973	24,154
New Hampshire	9,136	11,272	15,760	17,363	18,613	19,636	22,689
Rhode Island	9,448	10,880	13,885	15,555	16,786	17,826	20,770
Vermont	8,686	9,984	12,616	14,193	15,443	16,489	19,350

Source: U.S. Bureau of Economic Analysis and Cambridge Systematics estimates.

Table 7.5 Defense Contract Awards, 1963 to 1992 (millions of dollars)

Year	United States	New England	New England as % of U.S.	Connecticut	Maine	Massachusetts	Hampshire	Rhode Island	Vermont
1963	28,108	2,277	8.1%	1,049	58	1,060	51	47	12
1964	27,470	2,307	8.4%	1,126	32	1,032	65	38	14
1965	26,631	2,598	9.8%	1,180	69	1,179	52	86	32
1966	NA	NA	NA	NA	NA	NA	NA	NA	NA
1967	NA	NA	NA	NA	NA	NA	NA	NA	NA
1968	NA	NA	NA	NA	NA	NA	NA	NA	NA
1969	NA	NA	NA	NA	NA	NA	NA	NA	NA
1970	33,570	2,731	8.1%	1,238	56	1,200	99	94	44
1971	NA	NA	NA	NA	NA	NA	NA	NA	NA
1972	36,283	3,049	8.4%	1,271	49	1,441	147	104	37
1973	34,741	2,917	8.4%	1,004	45	1,589	157	86	36
1974	NA	NA	NA	NA	NA	NA	NA	NA	NA
1975	43,355	4,559	10.5%	2,349	55	1,770	189	73	123
1976	44,679	4,523	10.1%	1,913	284	1,956	147	94	129
1977	52,752	5,089	9.6%	1,974	323	2,395	153	125	119
1978	61,174	7,109	11.6%	3,489	341	2,787	227	156	109
1979	65,481	7,695	11.8%	3,777	407	2,983	236	192	100
1980	76,430	8,743	11.4%	3,867	457	3,729	305	261	124
1981	96,653	10,357	10.7%	4,492	475	4,596	392	235	167
1982	115,280	13,007	11.3%	5,897	784	5,301	538	285	202
1983	118,744	12,845	10.8%	5,826	781	5,239	528	274	197
1984	124,015	14,249	11.5%	5,459	532	7,029	663	396	170
1985	140,096	15,486	11.1%	5,543	957	7,714	678	431	163
1986	136,026	15,749	11.6%	5,441	584	8,735	471	394	124
1987	133,262	15,606	11.7%	5,031	830	8,685	469	478	113
1988	125,767	13,753	10.9%	4,991	518	7,212	481	429	122
1989	119,917	16,267	13.6%	6,082	370	8,757	478	417	163
1990	124,119	13,888	11.2%	4,979	1,065	6,933	427	413	71
1991	NA	NA	NA	NA	NA	NA	NA	NA	NA
1992	124,119	11,030	8.9%	3,099	1,304	5,686	424	454	63

Source: U.S. Department of Defense.

Table 7.6 Annual Exports and Imports for U.S. and Boston Region, 1965 to 1991

Year	Total		Boston		Boston	
	U.S. Exports	U.S. Imports	Region Exports		Region Imports	
	(\$ mil.'s)	(\$ mil.'s)	(\$ mil.'s)	(as % of U.S. Total)	(\$ mil.'s)	(as % of U.S. Total)
1965	27,500	21,400	156	0.6%	684	3.2%
1966	NA	NA	NA	NA	NA	NA
1967	31,534	26,816	2,762	8.8%	3,588	13.4%
1968	34,413	33,114	2,939	8.5%	4,662	14.1%
1969	38,006	36,043	3,379	8.9%	5,428	15.1%
1970	43,200	40,000	3,297	7.6%	5,678	14.2%
1971	44,137	45,602	3,964	9.0%	6,529	14.3%
1972	49,676	55,555	4,478	9.0%	7,491	13.5%
1973	71,300	69,500	5,713	8.0%	8,997	12.9%
1974	98,500	101,000	7,713	7.8%	11,037	10.9%
1975	107,600	96,900	7,809	7.3%	9,946	10.3%
1976	115,000	120,700	8,667	7.5%	12,376	10.3%
1977	121,200	147,700	9,613	7.9%	14,681	9.9%
1978	143,700	172,000	10,275	7.2%	17,870	10.4%
1979	181,800	206,300	12,361	6.8%	19,934	9.7%
1980	220,700	240,800	14,339	6.5%	21,636	9.0%
1981	233,700	261,000	15,400	6.6%	24,400	9.3%
1982	212,300	244,000	13,700	6.5%	24,300	10.0%
1983	200,500	258,000	14,900	7.4%	27,500	10.7%
1984	217,900	325,700	17,700	8.1%	36,200	11.1%
1985	213,100	345,300	17,500	8.2%	37,000	10.7%
1986	217,300	370,000	18,300	8.4%	40,300	10.9%
1987	254,100	406,200	21,000	8.3%	44,400	10.9%
1988	322,400	441,000	25,400	7.9%	47,700	10.8%
1989	363,800	473,400	25,200	6.9%	49,300	10.4%
1990	393,600	495,300	35,000	8.9%	52,000	10.5%
1991	421,900	488,100	33,700	8.0%	50,500	10.3%

Note: Boston Customs Region includes Portland, ME, St. Albans, VT; Boston, MA; Providence, RI; Bridgeport, CT; Ogdensburg, NY; and Buffalo, NY districts.)

Sources: U.S. Bureau of the Census, *Highlights of U.S. Export and Import Trade*, FT 990, monthly (1965-1988);
U.S. Merchandise and Trade, *Selected Highlights*, series FT 920, monthly (1989);
U.S. Merchandise and Trade, *Export, General Imports, and Imports for Consumption*, FT 925, (1989).

Table 7.7 Total New England Exports by Country, 1992

Country	Total \$ Value	Air Weight (KG)	Air \$ Value	Vessel \$ Value	Containerized \$ Value	Vessel Wt. (KGx1000)	Containerized Vessel Wt. (KGx1000)
Total All Countries	16,284,280,297	82,443,512	6,465,922,333	1,840,597,704	1,168,283,790	1,057,948	271,440
Europe (& Poland)	8,306,599,904	74,079,692	5,900,201,391	1,794,979,892	1,167,629,792	730,975	270,191
Canada	7,314,033,886	7,189,264	465,077,185	39,445,454	0	273,951	0
Mexico	663,646,507	1,174,556	100,643,757	6,172,358	653,998	53,022	1,249
France	1,291,258,143	14,633,470	1,089,939,912	110,554,256	68,598,100	37,238	16,215
United Kingdom	1,865,733,786	15,982,810	1,336,271,222	388,621,341	243,428,441	124,095	49,263
Germany	1,549,090,304	11,750,790	1,073,342,942	365,674,825	211,982,811	110,848	33,675
Netherlands	1,026,130,970	6,911,657	584,847,338	369,108,431	303,117,827	62,040	44,555
Italy	622,700,659	8,106,458	456,991,529	119,425,287	70,083,007	87,886	28,073
Sweden	211,192,747	1,398,004	161,609,090	34,166,355	25,396,281	6,482	5,236
Spain	242,030,140	2,477,847	182,481,013	47,207,768	26,997,521	30,100	8,747
Belgium	403,482,161	3,292,891	191,719,371	153,525,566	98,674,808	57,656	42,628
Switzerland	244,751,060	2,491,675	211,403,121	17,010,076	9,866,350	2,206	1,308
Ireland	372,132,269	3,046,280	317,599,442	34,275,005	19,729,828	11,022	6,261
Norway	59,858,852	405,803	41,765,011	13,725,792	5,792,288	12,807	1,309
Austria	97,584,494	973,503	82,514,000	8,277,610	4,938,313	914	731
Denmark	81,152,062	605,353	55,316,742	18,959,531	11,252,089	5,245	2,278
Finland	51,280,605	477,944	36,906,298	12,153,034	4,075,237	125,976	1,211
Poland	89,279,140	566,087	23,767,674	64,017,678	42,846,683	46,611	20,236
Portugal	45,960,437	559,851	25,456,501	17,677,424	13,832,480	6,034	5,472
Greece	42,521,793	362,881	22,069,916	18,727,335	5,712,251	3,089	2,318
Luxembourg	9,261,373	24,207	5,153,700	1,747,578	1,227,900	717	669
Liechtenstein	925,228	6,575	791,863	116,164	73,760	8	6
Monaco	273,681	5,606	254,706	8,836	3,817	1	0

Source: Massachusetts Port Authority International Trade Development Unit.

Table 7.8 Total New England Exports by Industry, 1992

SIC Code	Industry	Total \$ Value	Air Air \$ Value	Weight (KG)	Vessel \$ Value	Containerized \$ Value	Vessel Wt. (KGx1000)	Containerized Vessel Wt. (KGx1000)
	Total All Industries	23,767,238,350	10,881,953,343	130,852,765	4,607,916,992	2,582,732,168	3,470,652	689,929
SIC 1	Agricultural Production-Crops	108,813,417	1,026,747	435,523	64,862,148	35,361,980	176,293	10,924
SIC 2	Agricultural Products-Livestock	77,049,997	44,948,582	1,025,324	14,503,785	13,087,731	11,254	10,501
SIC 23	Apparel and Other Textile Products	106,503,818	30,654,136	1,131,605	31,600,584	24,830,803	2,515	1,940
SIC 12	Bituminous Coal and Lignite Mining	14,798,255	7,533	147,125	14,786,209	0	375,574	0
SIC 98	Canadian, Non-Canadian Goods Ret'n	150,703,955	11,661,729	2,030,434	333,619	0	52	0
SIC 28	Chemicals and Allied Products	1,269,051,016	246,395,211	9,782,678	390,201,032	205,514,288	322,638	84,659
SIC 36	Electronic, Electric Equip., Exc Comp	5,340,642,413	2,212,945,519	11,755,461	364,151,561	263,834,933	21,709	15,487
SIC 34	Fabricated Metal Products	1,175,212,371	388,006,602	5,706,120	472,673,802	235,876,363	35,090	19,873
SIC 9	Fishing, Hunting, and Trapping	278,211,696	115,979,328	17,390,359	77,196,106	58,999,219	49,048	20,012
SIC 20	Food and Kindred Products	273,346,941	14,052,882	3,411,350	117,837,212	81,137,346	78,095	41,714
SIC 8	Forestry	21,765,296	3,816,616	159,263	7,397,438	3,822,420	1,762	929
SIC 25	Furniture and Fixtures	63,025,554	7,651,515	347,518	30,988,070	13,966,284	3,570	2,631
SIC 35	Industrial Machinery, Computer Equip.	5,463,938,935	3,396,051,321	26,655,762	659,488,407	389,165,521	44,926	23,617
SIC 38	Instruments and Related Products	2,855,700,523	1,997,238,770	11,586,389	491,640,069	352,586,529	16,715	12,654
SIC 31	Leather and Leather Products	325,556,990	68,746,118	2,687,719	171,637,582	134,375,705	27,178	22,316
SIC 24	Lumber and Wood Products	245,426,516	1,118,824	160,088	52,888,197	28,126,842	169,395	47,277
SIC 10	Metal Mining	46,148,443	39,067	15,809	5,697,106	3,534,265	4,617	926
SIC 39	Misc. Manufacturing Industries	442,782,497	184,199,976	4,040,020	106,690,619	63,357,471	12,655	8,310
SIC 14	Nonmetallic Mineral, Except Fuels	31,636,210	650,443	947,154	11,920,060	8,502,104	29,268	13,211
SIC 13	Oil and Gas Extraction	3,368,595	165,326	55,062	3,137,633	70,379	8,111	7
SIC 26	Paper and Allied Products	638,280,203	19,138,719	5,941,052	257,292,400	139,521,104	355,682	129,133
SIC 29	Petroleum and Coal Products	61,195,773	427,421	85,091	43,022,711	16,965,738	116,138	3,826
SIC 33	Primary Metal Industries	471,167,230	166,464,317	4,360,670	125,780,227	76,787,326	46,688	15,697
SIC 27	Printing and Publishing	278,401,205	117,138,503	3,515,038	40,071,708	26,585,093	5,537	3,903
SIC 30	Rubber and Misc. Plastics Products	411,256,034	100,290,988	3,395,274	136,017,982	83,709,825	27,737	18,307
SIC 91	Scrap and Waste	330,409,895	9,386,342	755,414	198,641,903	54,328,260	1,433,907	126,514
SIC 99	Special Classification Provisions, NS	314,790,582	67,827,033	1,906,298	81,005,651	47,398,561	22,195	17,993
SIC 32	Stone, Clay, and Glass Products	159,150,177	34,477,852	1,099,122	56,423,591	41,497,355	20,076	10,085
SIC 21	Tobacco Manufacturers	243,989	8,800	108	58,594	12,306	1	0
SIC 22	Textile Mill Products	363,771,778	58,037,365	6,754,228	131,519,121	85,487,028	23,438	16,268
SIC 37	Transportation Equipment	2,395,926,528	1,544,720,113	3,503,398	439,816,324	87,918,657	25,945	9,299
SIC 92	Used or Second-Hand Merchandise	48,961,518	38,679,645	66,309	8,635,541	6,370,732	2,843	1,916

Source: Massachusetts Port Authority International Trade Development Unit.

Table 7.9 Tourism in New England
Total Visits and Major Attractions/Regions

State	Major Attractions/Regions	Total Annual Visits
Total Visits to New England		100,449,200
Connecticut:	Total visits to major attractions:	8,109,800
	Ledyard Casino	2,000,000
	Hammonasset Beach State Park	1,060,065
	Mystic Aquarium	765,000
	Lake Compounce Festival Park	536,000
	Maritime Center, Norwalk	461,413
	Sherwood Island State Park	471,130
	Mystic Seaport	443,800
	Rocky Neck State Park	412,495
Maine:	Total overnight visits:	8,639,400
	South Coast (Kittery, Portland, Freeport)	41% dollars spent
	Acadia National Park	19% dollars spent
	Western Lakes and Mountains	14% dollars spent
	Mid-coast	13% dollars spent
	Kennebec Valley and other	13% dollars spent
Massachusetts:	Total visits (including MA resident visiting other portions of state):	26,700,000
	Boston	8,200,000
	Museum of Science	1,000,000
	New England Aquarium	850,000
	Faneuil Hall Marketplace	NA
	Children's Museum	NA
	Cape Cod	2,000,000
	Nantucket Island, Martha's Vineyard	1,100,000
	Riverside Park	NA
	Sturbridge Village	500,000
New Hampshire:	Total visits (including day trips):	24,000,000
	Merrimack Valley	32% visits
	Lakes Region	19% visits
	Sea coast (beaches, Portsmouth)	19% visits
	White Mountains	16% visits
	Dartmouth-Lake Sunapee	9% visits
	Mt. Monadnock	5% visits

Table 7.9 Tourism in New England
Total Visits and Major Attractions/Regions (continued)

State	Major Attractions/Regions	Total Annual Visits
Rhode Island:	Total visits (including day trips):	25,000,000
	Newport (mansions)	800,000
	Block Island	NA
	Narraganset Bay	NA
	Rocky Point	NA
Vermont:	Total overnight visits:	7,900,000
	Summer activities: (Lake Champlain, Burlington, Mountain region)	40% dollars spent
	Fall activities: All areas	20% dollars spent
	Winter activities Mountain region	40% dollars spent

NA = Not available.

Note: Definition of "visits" varies by state. Numbers do not necessarily reflect comparable levels of tourist activity.
Numbers may be doublecounted for those visitors traveling to more than one New England state.

Source: State Offices of Tourism.

Figures

Figure 7.1 Population Trends
Index Year 1990=100

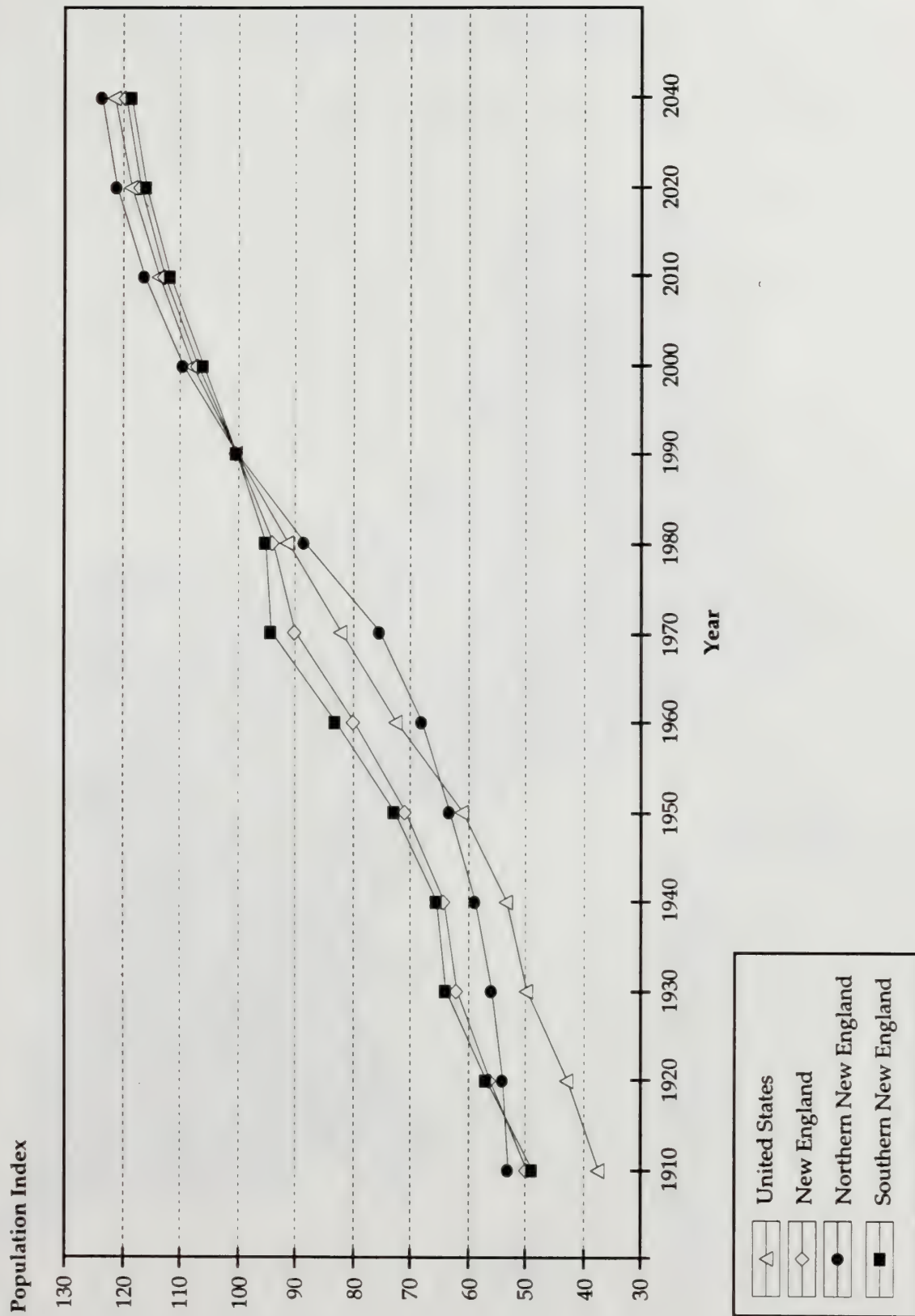


Figure 7.2 Population Density 1990 with Highways

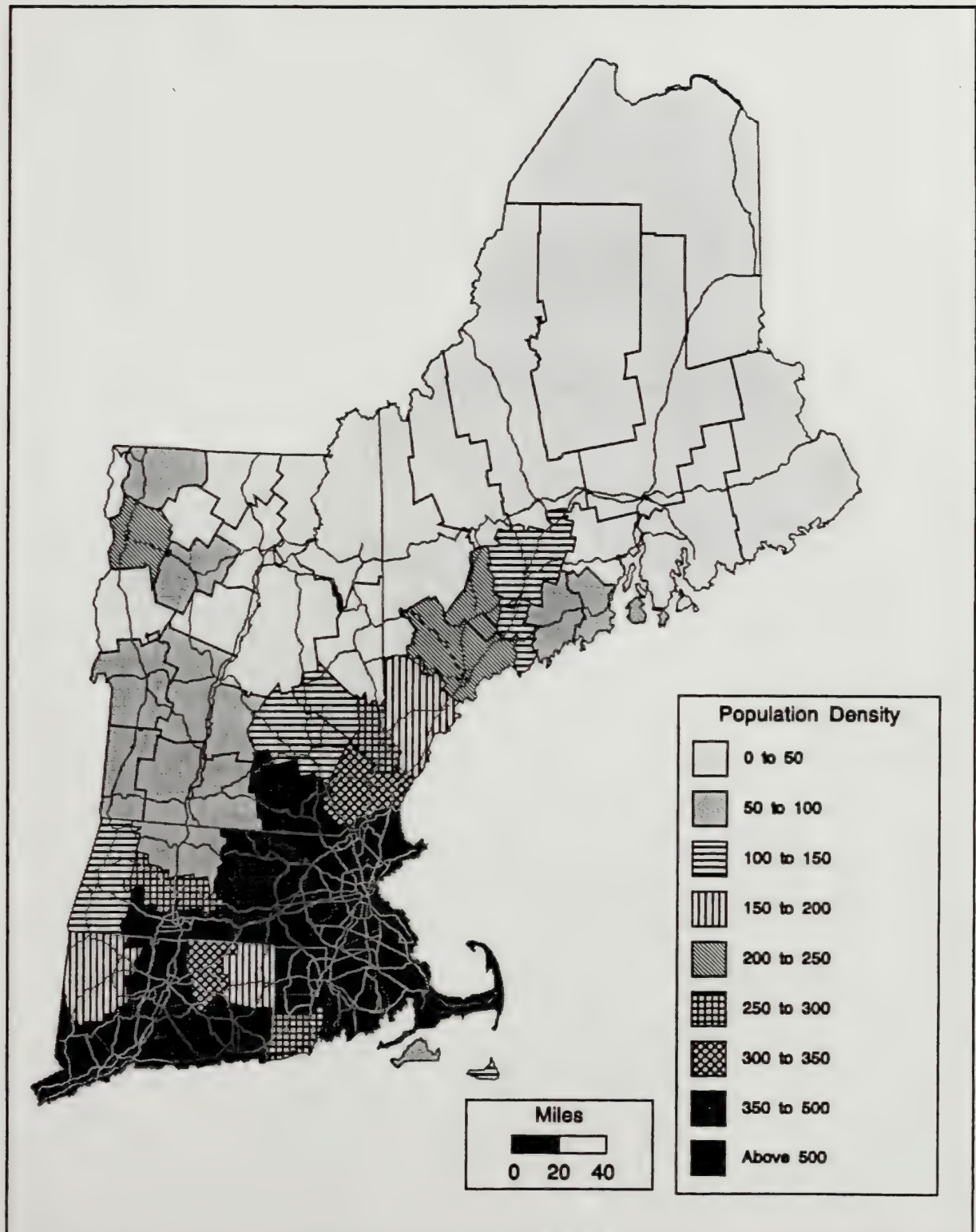


Figure 7.3 Population Density 1990 with Major Railroads

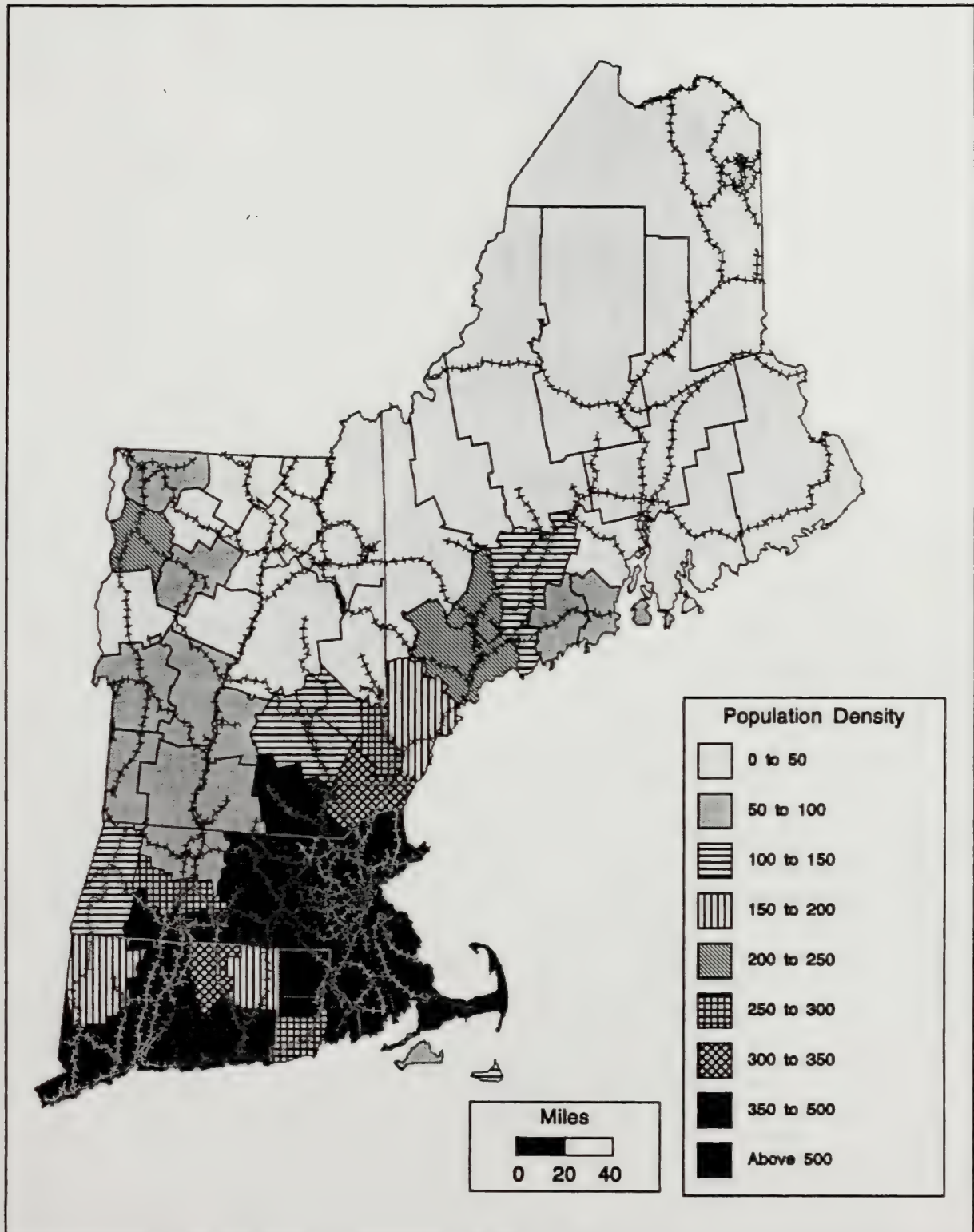


Figure 7.4 Change in Population Density 1990-2020

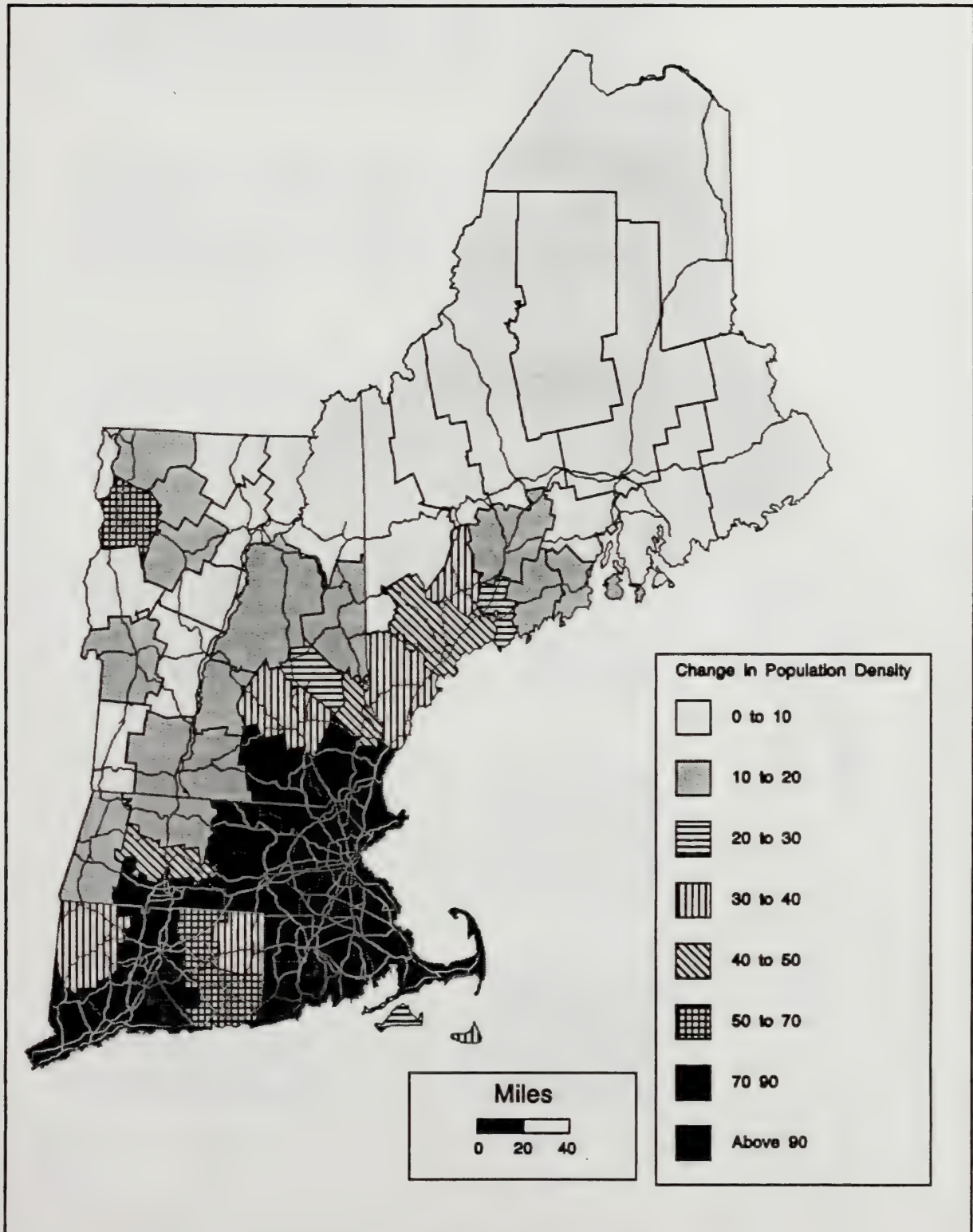


Figure 7.5 Industry Sector by Percentage of Total Employment
United States and New England, 1970-2020

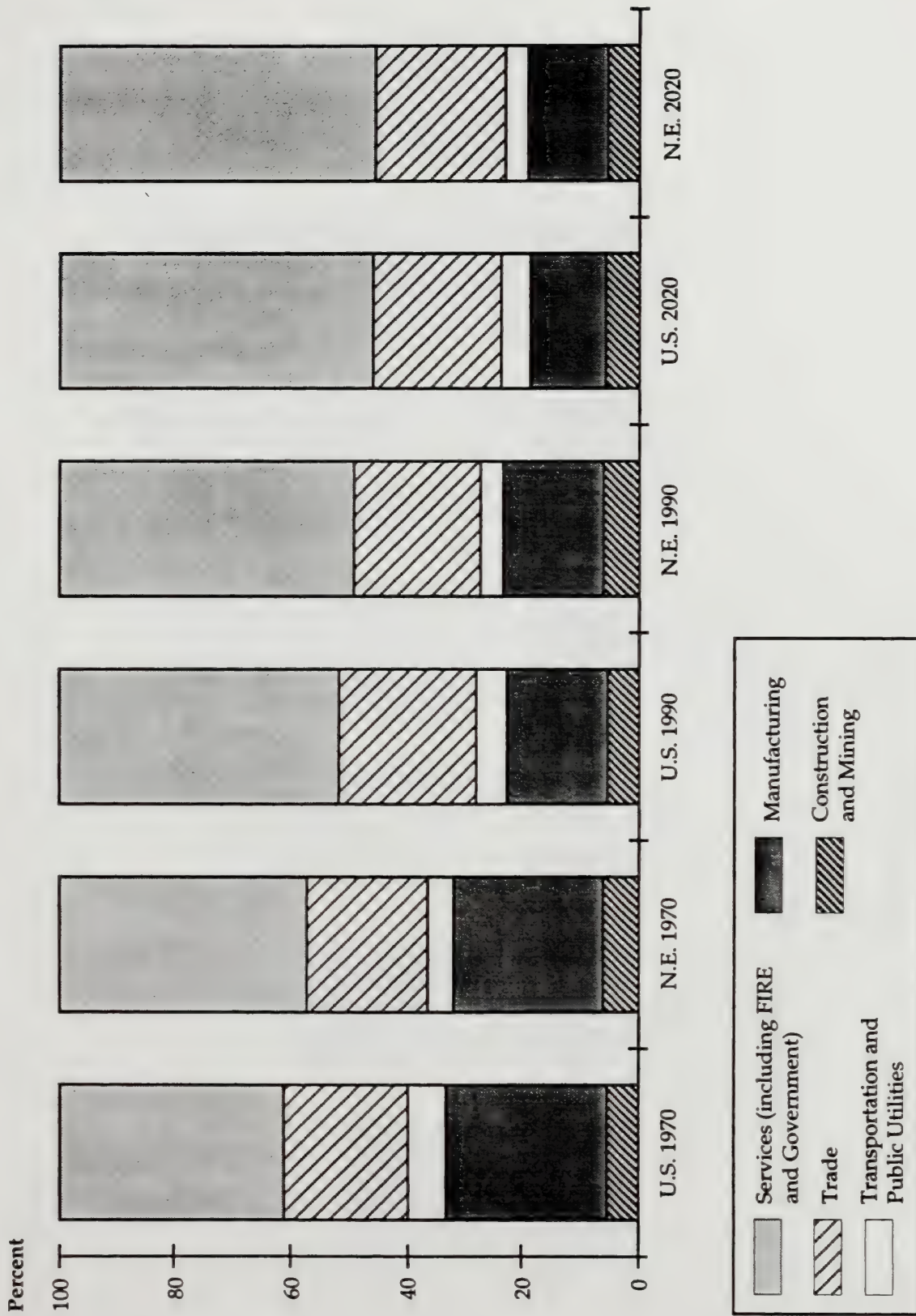


Figure 7.6 New England Employment by Sector, 1970-2040

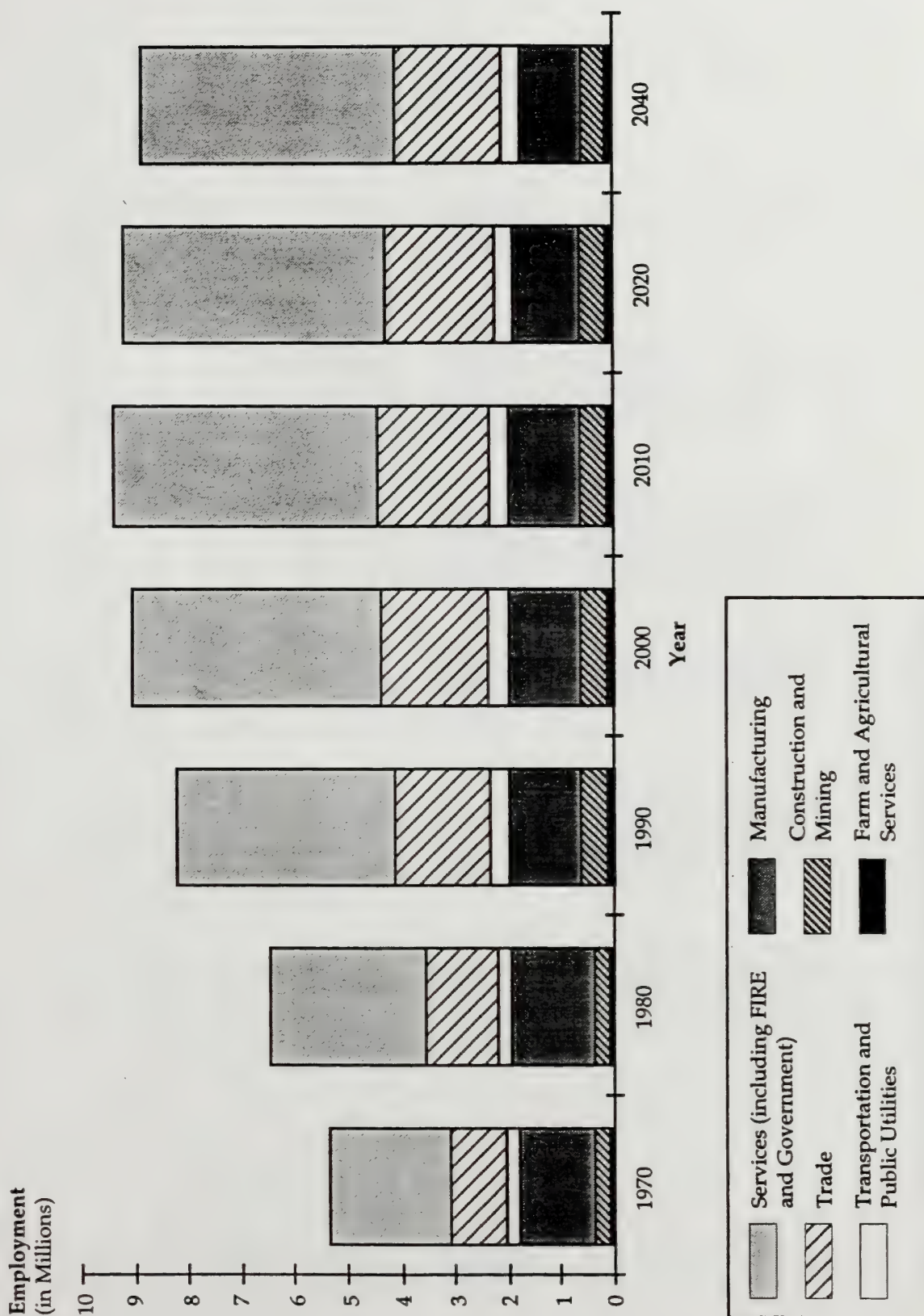


Table 7.7 Total New England Exports by Country, 1992

Country	Total \$ Value	Air Weight (KG)	Air \$ Value	Vessel \$ Value	Containerized \$ Value	Vessel Wt. (KGx1000)	Containerized Vessel Wt. (KGx1000)
Total All Countries	16,284,280,297	82,443,512	6,465,922,333	1,840,597,704	1,168,283,790	1,057,948	271,440
Europe (& Poland)	8,306,599,904	74,079,692	5,900,201,391	1,794,979,892	1,167,629,792	730,975	270,191
Canada	7,314,033,886	7,189,264	465,077,185	39,445,454	0	273,951	0
Mexico	663,646,507	1,174,556	100,643,757	6,172,358	653,998	53,022	1,249
France	1,291,258,143	14,633,470	1,089,939,912	110,554,256	68,598,100	37,238	16,215
United Kingdom	1,865,733,786	15,982,810	1,336,271,222	388,621,341	243,428,441	124,095	49,263
Germany	1,549,090,304	11,750,790	1,073,342,942	365,674,825	211,982,811	110,848	33,675
Netherlands	1,026,130,970	6,911,657	584,847,338	369,108,431	303,117,827	62,040	44,555
Italy	622,700,659	8,106,458	456,991,529	119,425,287	70,083,007	87,886	28,073
Sweden	211,192,747	1,398,004	161,609,090	34,166,355	25,396,281	6,482	5,236
Spain	242,030,140	2,477,847	182,481,013	47,207,768	26,997,521	30,100	8,747
Belgium	403,482,161	3,292,891	191,719,371	153,525,566	98,674,808	57,656	42,628
Switzerland	244,751,060	2,491,675	211,403,121	17,010,076	9,866,350	2,206	1,308
Ireland	372,132,269	3,046,280	317,599,442	34,275,005	19,729,828	11,022	6,261
Norway	59,858,852	405,803	41,765,011	13,725,792	5,792,288	12,807	1,309
Austria	97,584,494	973,503	82,514,000	8,277,610	4,938,313	914	731
Denmark	81,152,062	605,353	55,316,742	18,959,531	11,252,089	5,245	2,278
Finland	51,280,605	477,944	36,906,298	12,153,034	4,075,237	125,976	1,211
Poland	89,279,140	566,087	23,767,674	64,017,678	42,846,683	46,611	20,236
Portugal	45,960,437	559,851	25,456,501	17,677,424	13,832,480	6,034	5,472
Greece	42,521,793	362,881	22,069,916	18,727,335	5,712,251	3,089	2,318
Luxembourg	9,261,373	24,207	5,153,700	1,747,578	1,227,900	717	669
Liechtenstein	925,228	6,575	791,863	116,164	73,760	8	6
Monaco	273,681	5,606	254,706	8,836	3,817	1	0

Source: Massachusetts Port Authority International Trade Development Unit.

Table 7.8 Total New England Exports by Industry, 1992

SIC Code	Industry	Total \$ Value	Air Air \$ Value	Weight (KG)	Vessel \$ Value	Containerized \$ Value	Vessel Wt. (KGx1000)	Containerized Vessel Wt. (KGx1000)
	Total All Industries	23,767,238,350	10,881,953,343	130,852,765	4,607,916,992	2,582,732,168	3,470,652	689,929
SIC 1	Agricultural Production-Crops	108,813,417	1,026,747	435,523	64,862,148	35,361,980	176,293	10,924
SIC 2	Agricultural Products-Livestock	77,049,997	44,948,582	1,025,324	14,503,785	13,087,731	11,254	10,501
SIC 23	Apparel and Other Textile Products	106,503,818	30,654,136	1,131,605	31,600,584	24,830,803	2,515	1,940
SIC 12	Bituminous Coal and Lignite Mining	14,798,255	7,533	147,125	14,786,209	0	375,574	0
SIC 98	Canadian, Non-Canadian Goods Ref'n	150,703,955	11,661,729	2,030,434	333,619	0	52	0
SIC 28	Chemicals and Allied Products	1,269,051,016	246,395,211	9,782,678	390,201,032	205,514,288	322,638	84,659
SIC 36	Electronic, Electric Equip., Exc Comp	5,340,642,413	2,212,945,519	11,755,461	364,151,561	263,834,933	21,709	15,487
SIC 34	Fabricated Metal Products	1,175,212,371	388,006,602	5,706,120	472,673,802	235,876,363	35,090	19,873
SIC 9	Fishing, Hunting, and Trapping	278,211,696	115,979,328	17,390,359	77,196,106	58,999,219	49,048	20,012
SIC 20	Food and Kindred Products	273,346,941	14,052,882	3,411,350	117,837,212	81,137,346	78,095	41,714
SIC 8	Forestry	21,765,296	3,816,616	159,263	7,397,438	3,822,420	1,762	929
SIC 25	Furniture and Fixtures	63,025,554	7,651,515	347,518	30,988,070	13,966,284	3,570	2,631
SIC 35	Industrial Machinery, Computer Equip.	5,463,938,935	3,396,051,321	26,655,762	659,488,407	389,165,521	44,926	23,617
SIC 38	Instruments and Related Products	2,855,700,523	1,997,238,770	11,586,389	491,640,069	352,586,529	16,715	12,654
SIC 31	Leather and Leather Products	325,556,990	68,746,118	2,687,719	171,637,582	134,375,705	27,178	22,316
SIC 24	Lumber and Wood Products	245,426,516	1,118,824	160,088	52,888,197	28,126,842	169,395	47,277
SIC 10	Metal Mining	46,148,443	39,067	15,809	5,697,106	3,534,265	4,617	926
SIC 39	Misc. Manufacturing Industries	442,782,497	184,199,976	4,040,020	106,690,619	63,357,471	12,655	8,310
SIC 14	Nonmetallic Mineral, Except Fuels	31,636,210	650,443	947,154	11,920,060	8,502,104	29,268	13,211
SIC 13	Oil and Gas Extraction	3,368,595	165,326	55,062	3,137,633	70,379	8,111	7
SIC 26	Paper and Allied Products	638,280,203	19,138,719	5,941,052	257,292,400	139,521,104	355,682	129,133
SIC 29	Petroleum and Coal Products	61,195,773	427,421	85,091	43,022,711	16,965,738	116,138	3,826
SIC 33	Primary Metal Industries	471,167,230	166,464,317	4,360,670	125,780,227	76,787,326	46,688	15,697
SIC 27	Printing and Publishing	278,401,205	117,138,503	3,515,038	40,071,708	26,585,093	5,537	3,903
SIC 30	Rubber and Misc. Plastics Products	411,256,034	100,290,988	3,395,274	136,017,982	83,709,825	27,737	18,307
SIC 91	Scrap and Waste	330,409,895	9,386,342	755,414	198,641,903	54,328,260	1,433,907	126,514
SIC 99	Special Classification Provisions, NS	314,790,582	67,827,033	1,906,298	81,005,651	47,398,561	22,195	17,993
SIC 32	Stone, Clay, and Glass Products	159,150,177	34,477,852	1,099,122	56,423,591	41,497,355	20,076	10,085
SIC 21	Tobacco Manufacturers	243,989	8,800	108	58,594	12,306	1	0
SIC 22	Textile Mill Products	363,771,778	58,037,365	6,754,228	131,519,121	85,487,028	23,438	16,268
SIC 37	Transportation Equipment	2,395,926,528	1,544,720,113	3,503,398	439,816,324	87,918,657	25,945	9,299
SIC 92	Used or Second-Hand Merchandise	48,961,518	38,679,645	66,309	8,635,541	6,370,732	2,843	1,916

Source: Massachusetts Port Authority International Trade Development Unit.

Table 7.9 Tourism in New England
Total Visits and Major Attractions/Regions

State	Major Attractions/Regions	Total Annual Visits
Total Visits to New England		100,449,200
Connecticut:	Total visits to major attractions:	8,109,800
	Ledyard Casino	2,000,000
	Hammonasset Beach State Park	1,060,065
	Mystic Aquarium	765,000
	Lake Compounce Festival Park	536,000
	Maritime Center, Norwalk	461,413
	Sherwood Island State Park	471,130
	Mystic Seaport	443,800
	Rocky Neck State Park	412,495
Maine:	Total overnight visits:	8,639,400
	South Coast (Kittery,Portland,Freeport)	41% dollars spent
	Acadia National Park	19% dollars spent
	Western Lakes and Mountains	14% dollars spent
	Mid-coast	13% dollars spent
	Kennebec Valley and other	13% dollars spent
Massachusetts:	Total visits (including MA resident visiting other portions of state):	26,700,000
	Boston	8,200,000
	Museum of Science	1,000,000
	New England Aquarium	850,000
	Faneuil Hall Marketplace	NA
	Children's Museum	NA
	Cape Cod	2,000,000
	Nantucket Island, Martha's Vineyard	1,100,000
	Riverside Park	NA
	Sturbridge Village	500,000
New Hampshire:	Total visits (including day trips):	24,000,000
	Merrimack Valley	32% visits
	Lakes Region	19% visits
	Sea coast (beaches, Portsmouth)	19% visits
	White Mountains	16% visits
	Dartmouth-Lake Sunapee	9% visits
	Mt. Monadnock	5% visits

Table 7.9 Tourism in New England
Total Visits and Major Attractions/Regions (continued)

State	Major Attractions/Regions	Total Annual Visits
Rhode Island:	Total visits (including day trips):	25,000,000
	Newport (mansions)	800,000
	Block Island	NA
	Narraganset Bay	NA
	Rocky Point	NA
Vermont:	Total overnight visits:	7,900,000
	Summer activities: (Lake Champlain, Burlington, Mountain region)	40% dollars spent
	Fall activities: All areas	20% dollars spent
	Winter activities Mountain region	40% dollars spent

NA = Not available.

Note: Definition of "visits" varies by state. Numbers do not necessarily reflect comparable levels of tourist activity.
Numbers may be doublecounted for those visitors traveling to more than one New England state.

Source: State Offices of Tourism.

Figures

Figure 7.1 Population Trends
Index Year 1990=100

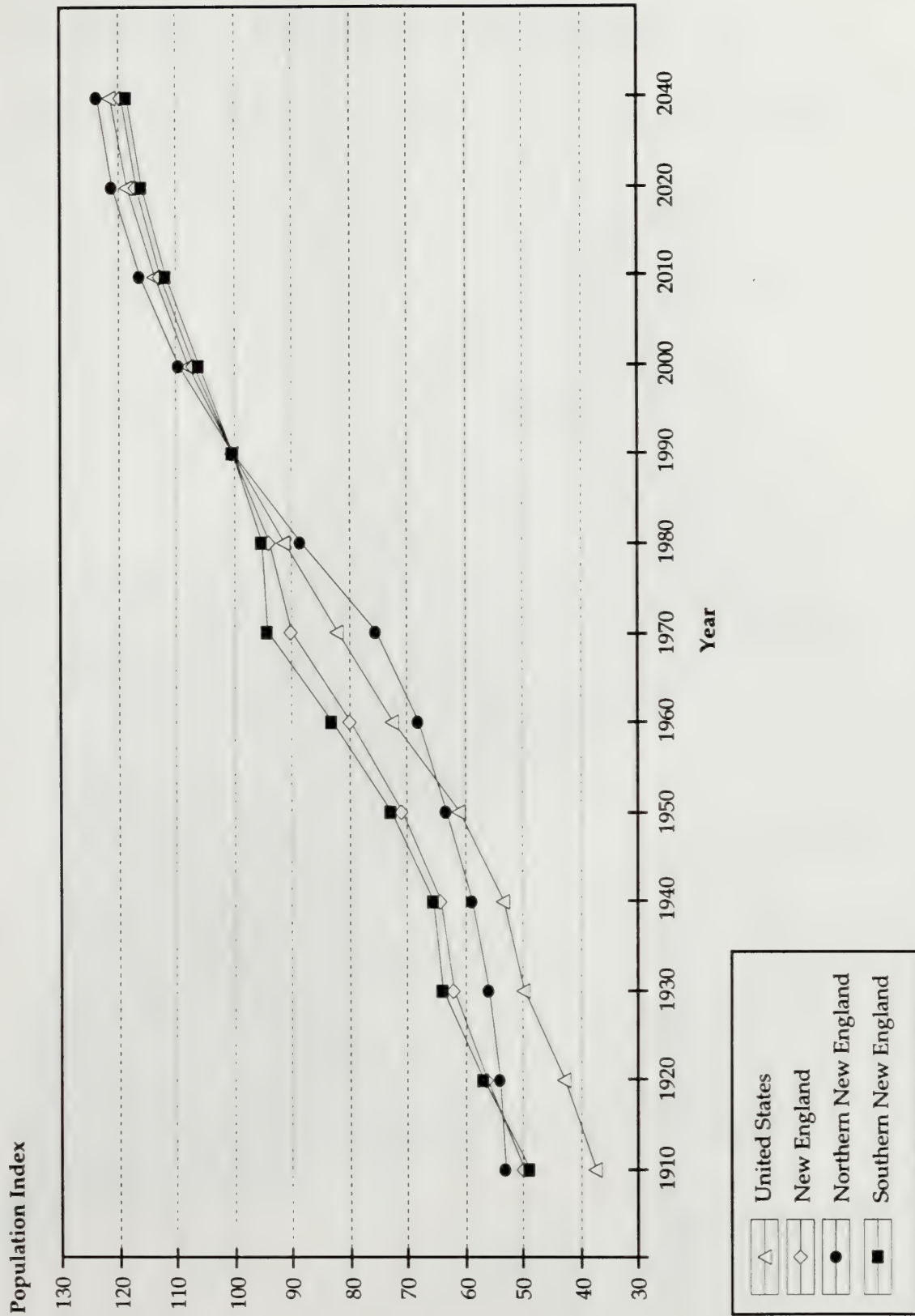


Figure 7.2 Population Density 1990 with Highways

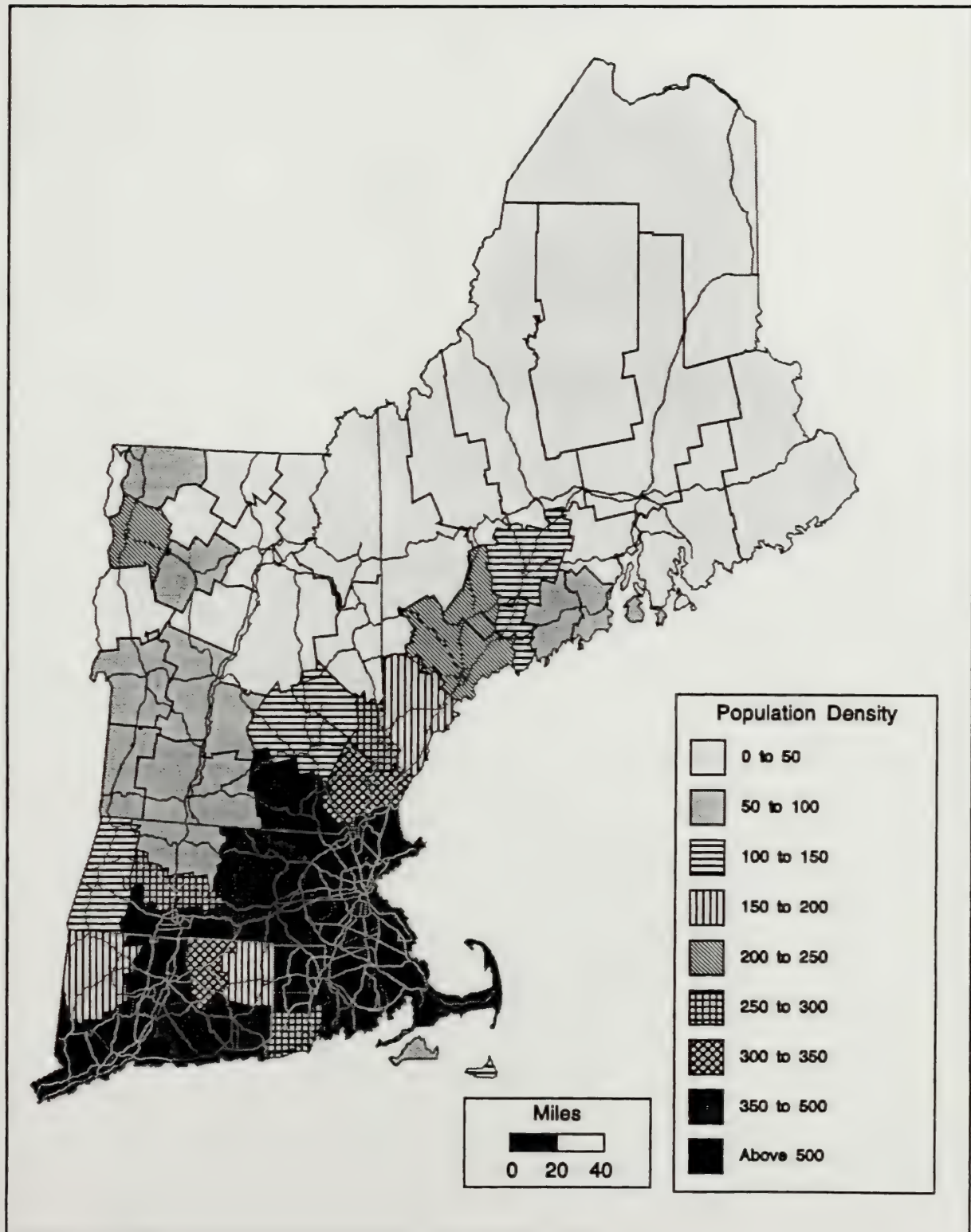


Figure 7.3 Population Density 1990 with Major Railroads

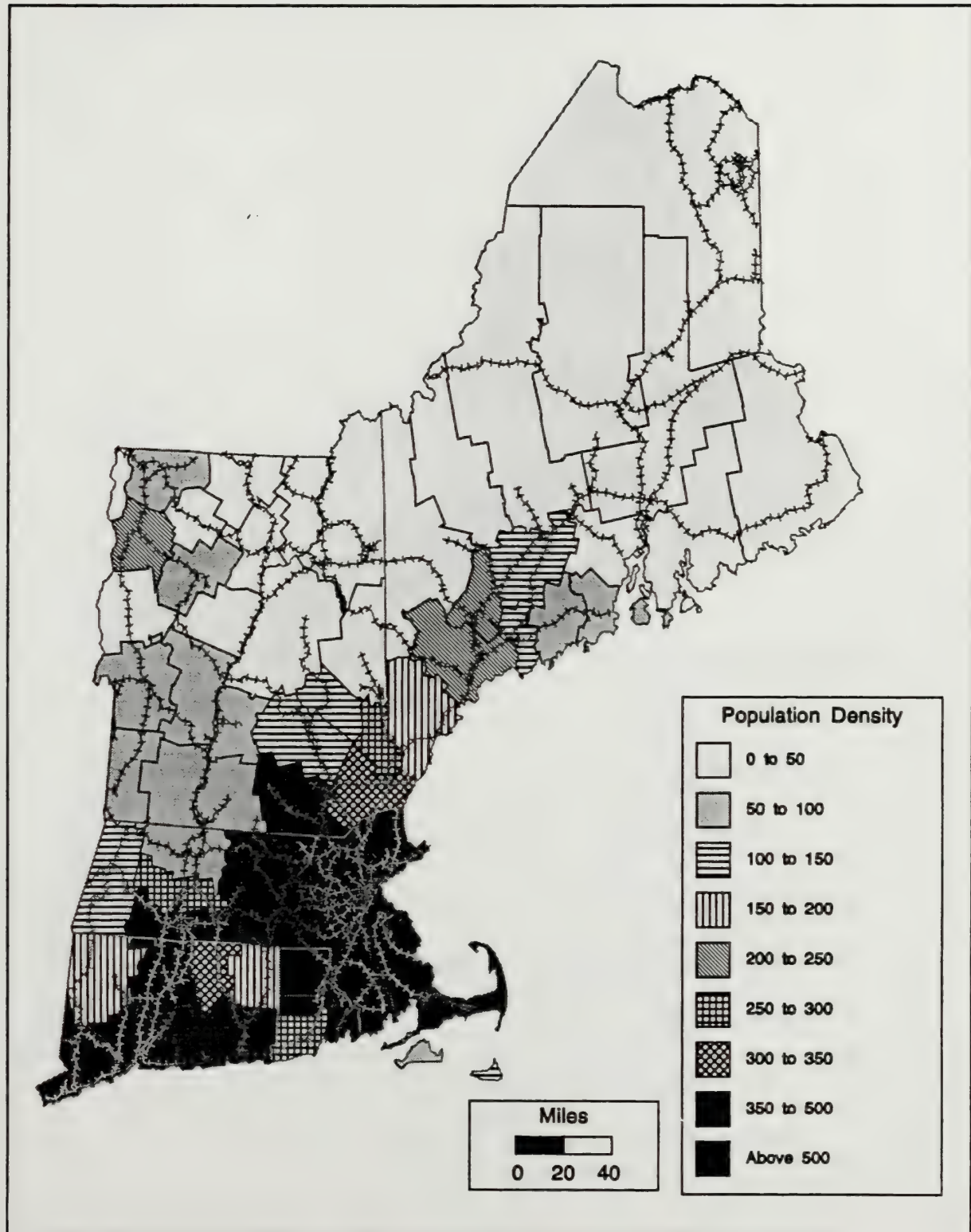


Figure 7.4 Change in Population Density 1990-2020

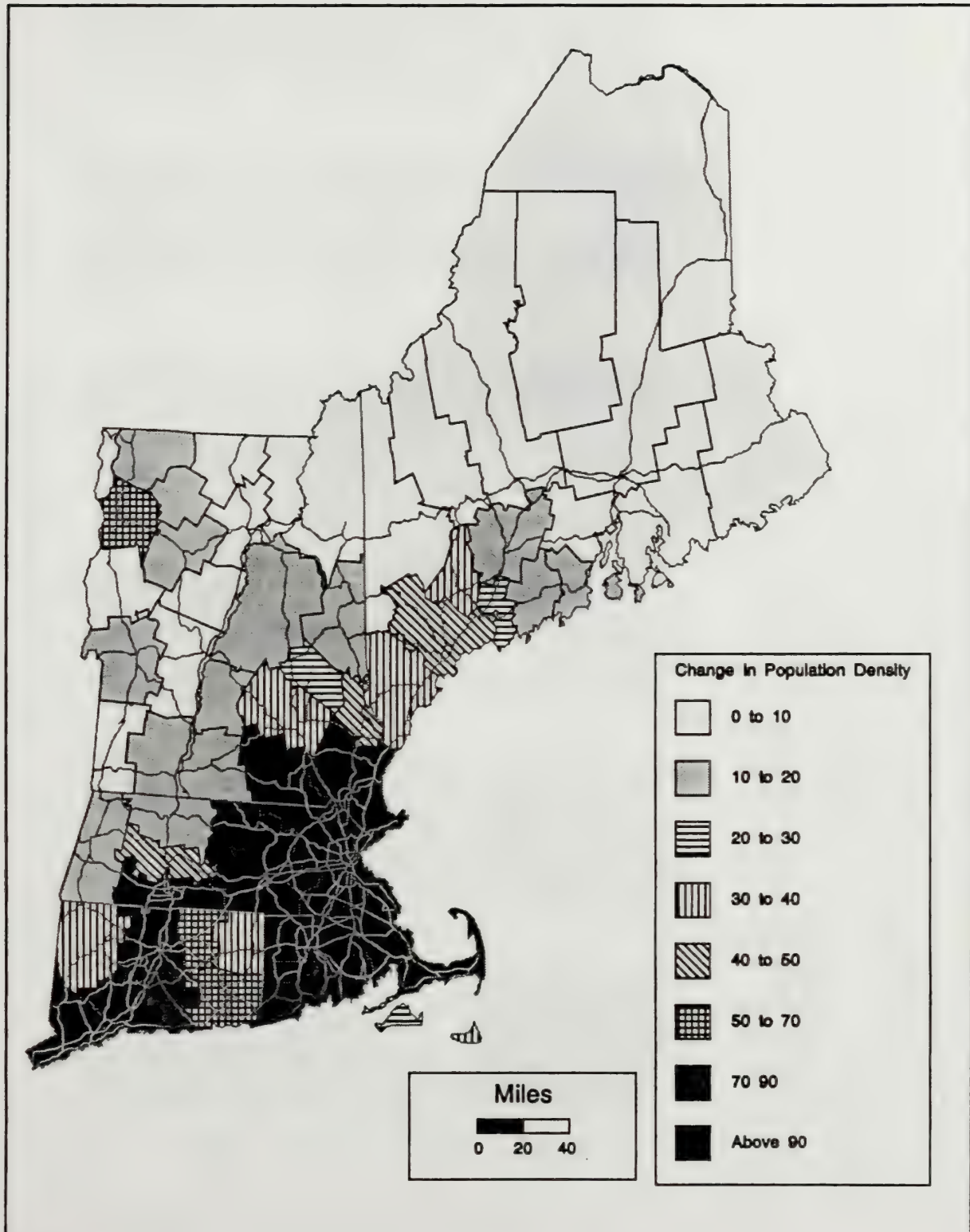


Figure 7.5 Industry Sector by Percentage of Total Employment
United States and New England, 1970-2020

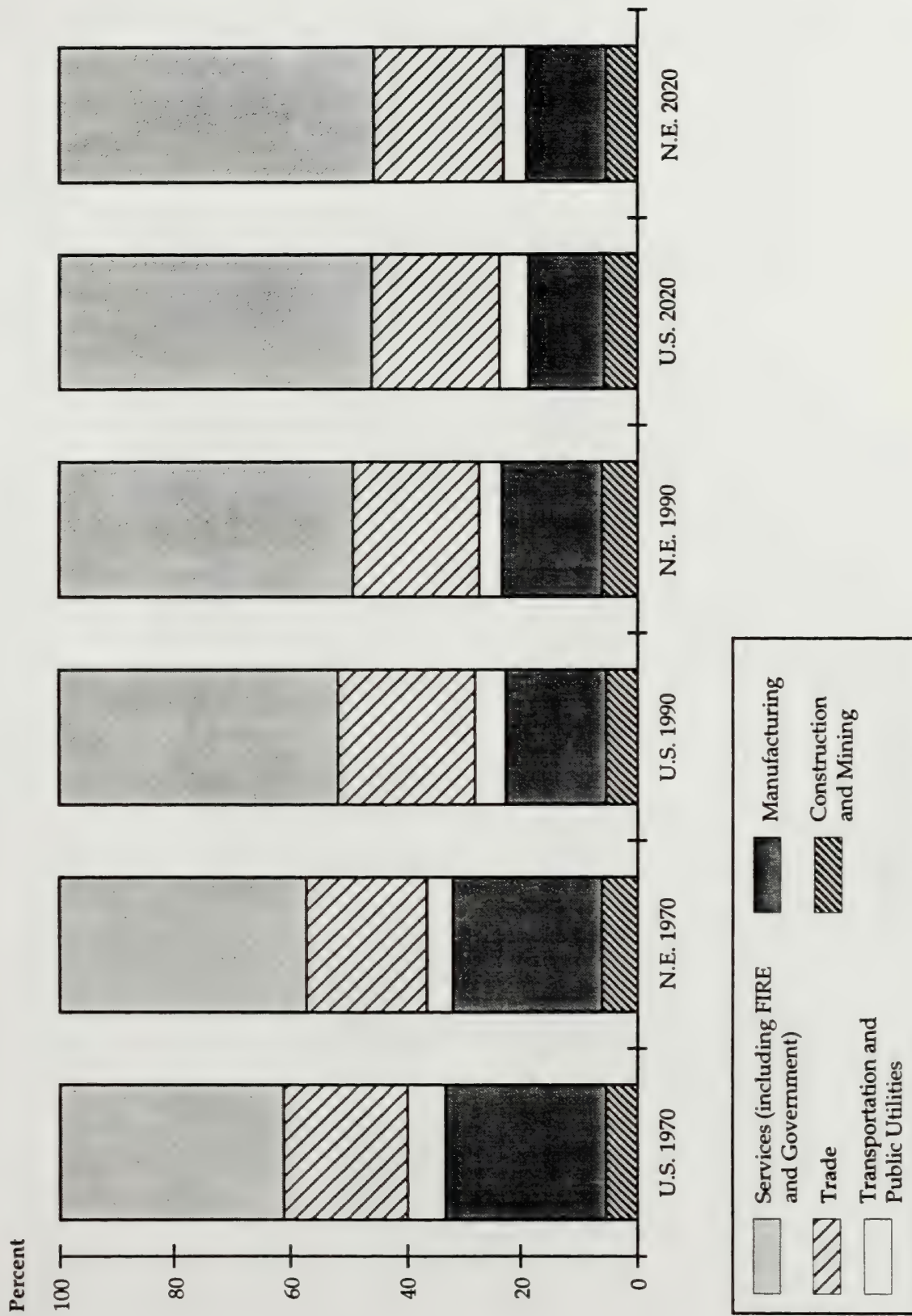


Figure 7.6 New England Employment by Sector, 1970-2040

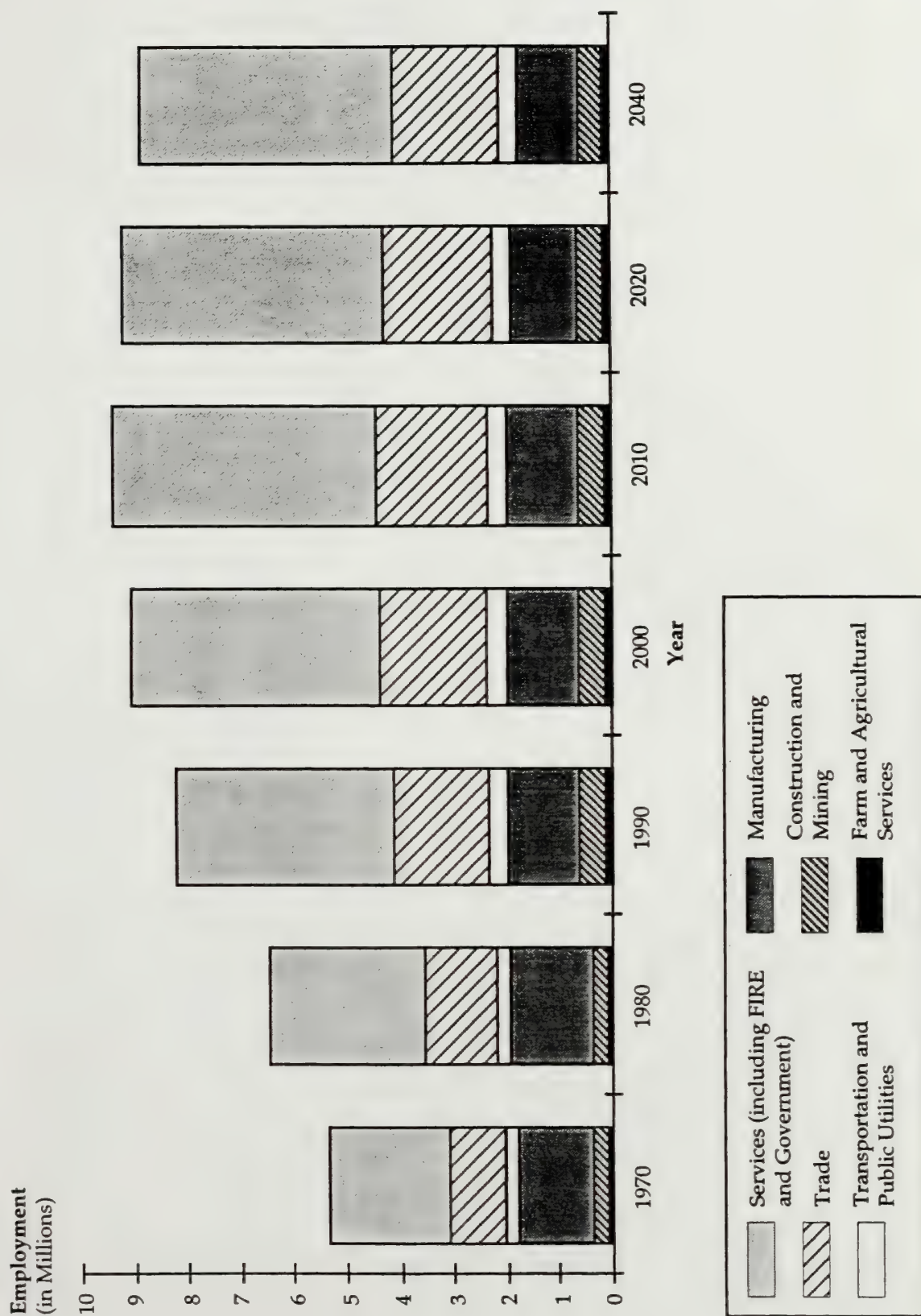


Figure 7.7 New England Employment by Sector
Index Year 1990=100

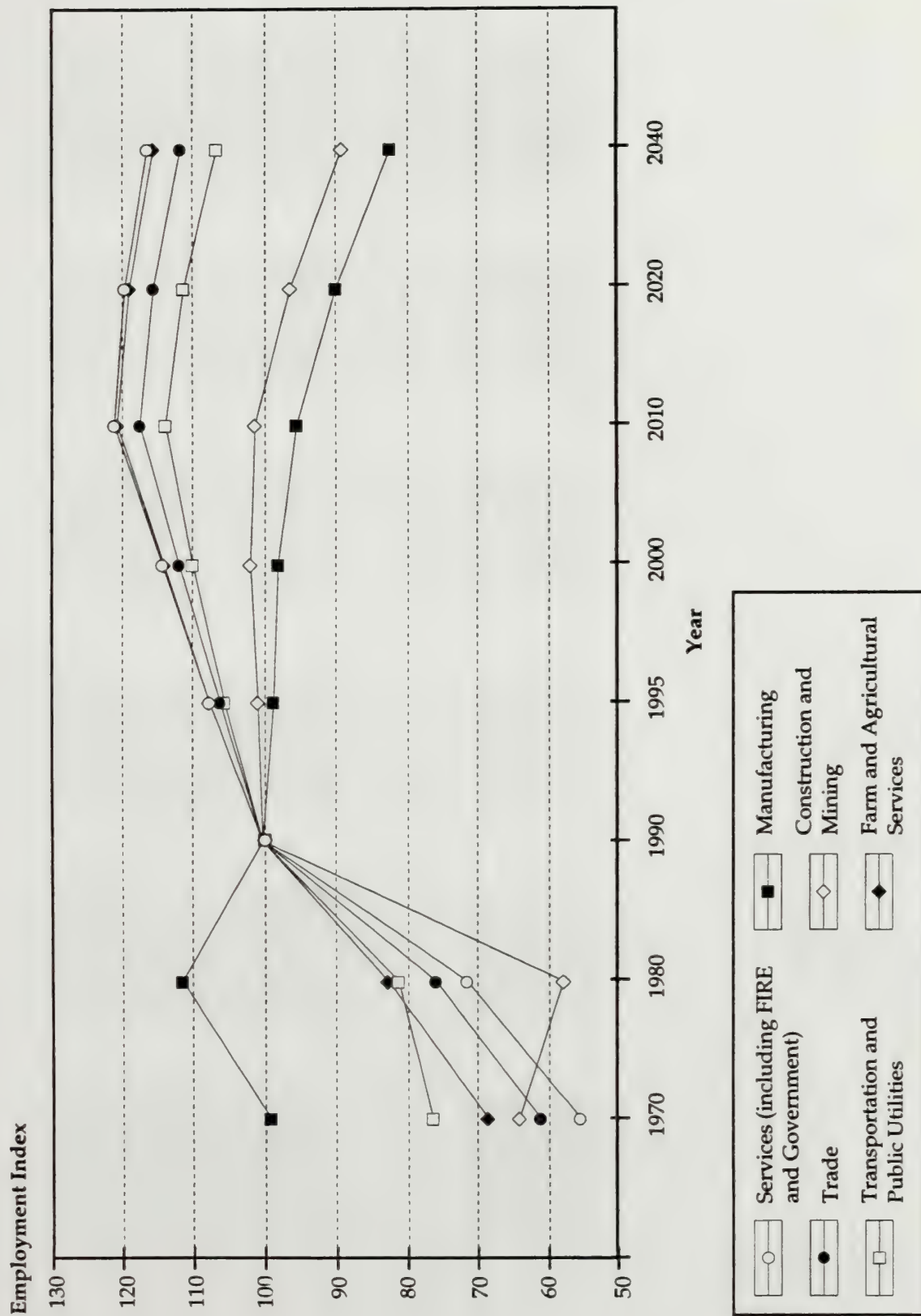


Figure 7.8 Industry Sector by Percentage of Total Employment
Six New England States, 1990

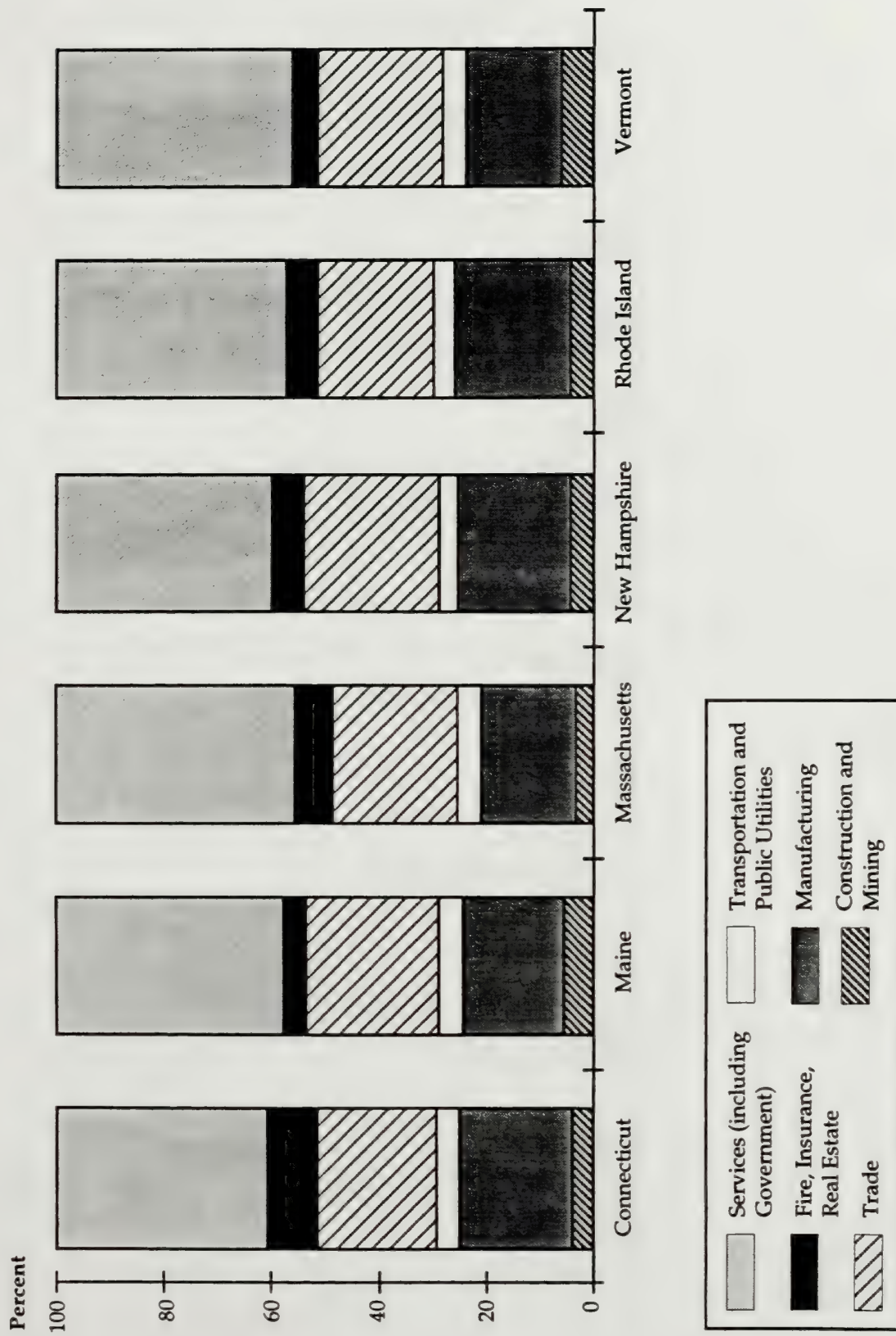


Figure 7.9 Total Employment by State

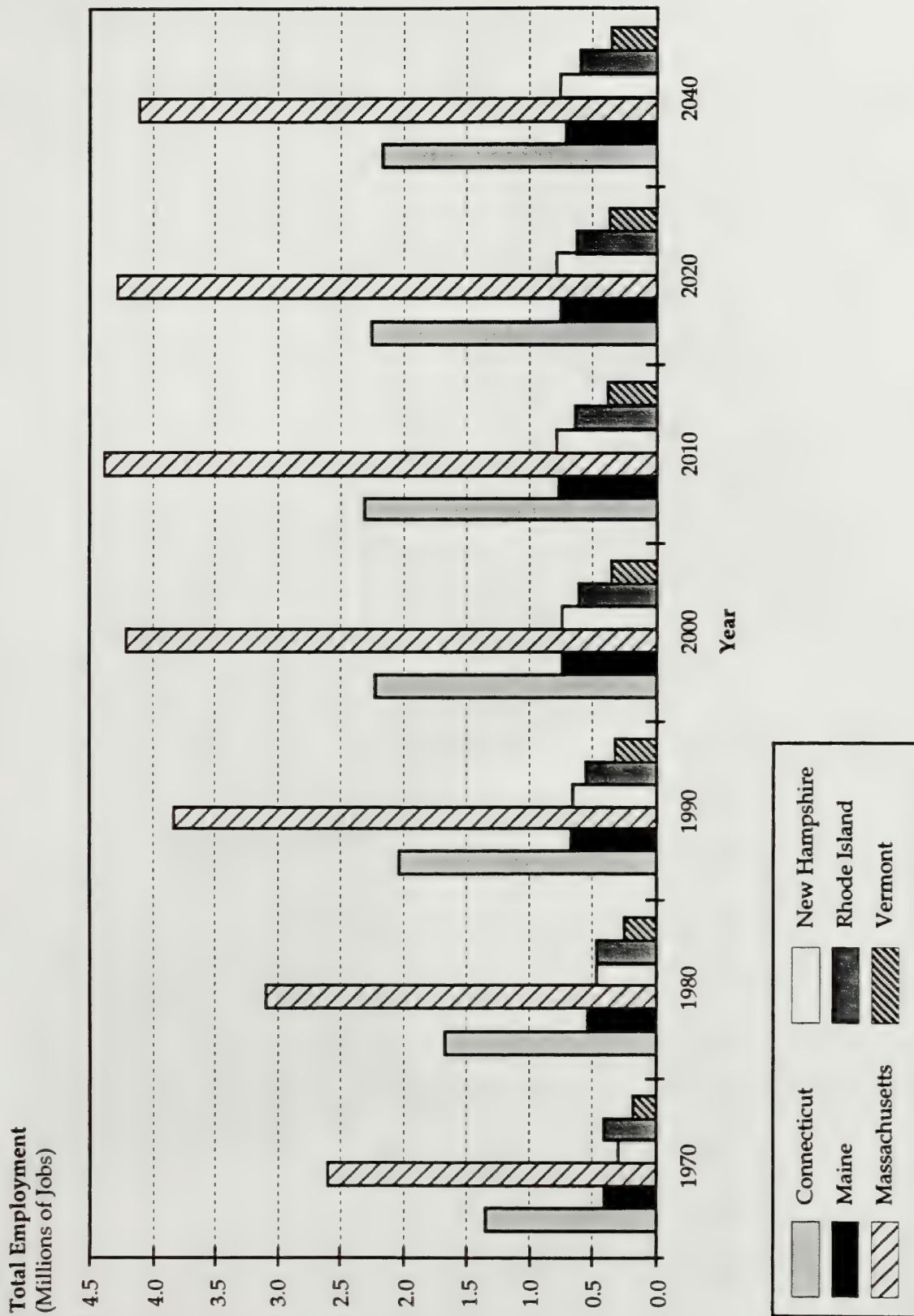


Figure 7.10 Employment Density – 1990

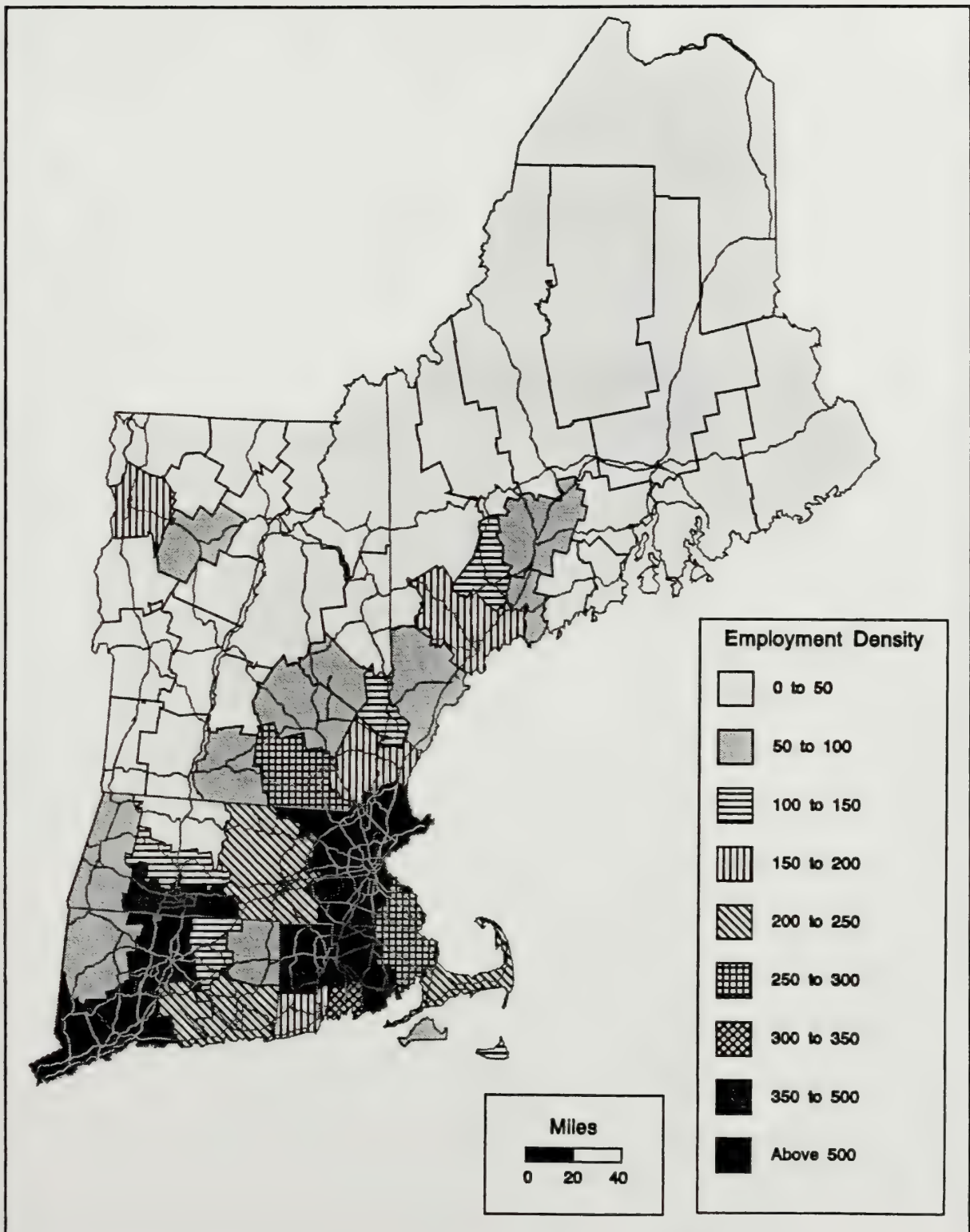


Figure 7.11 Absolute Change in Employment 1990-2020

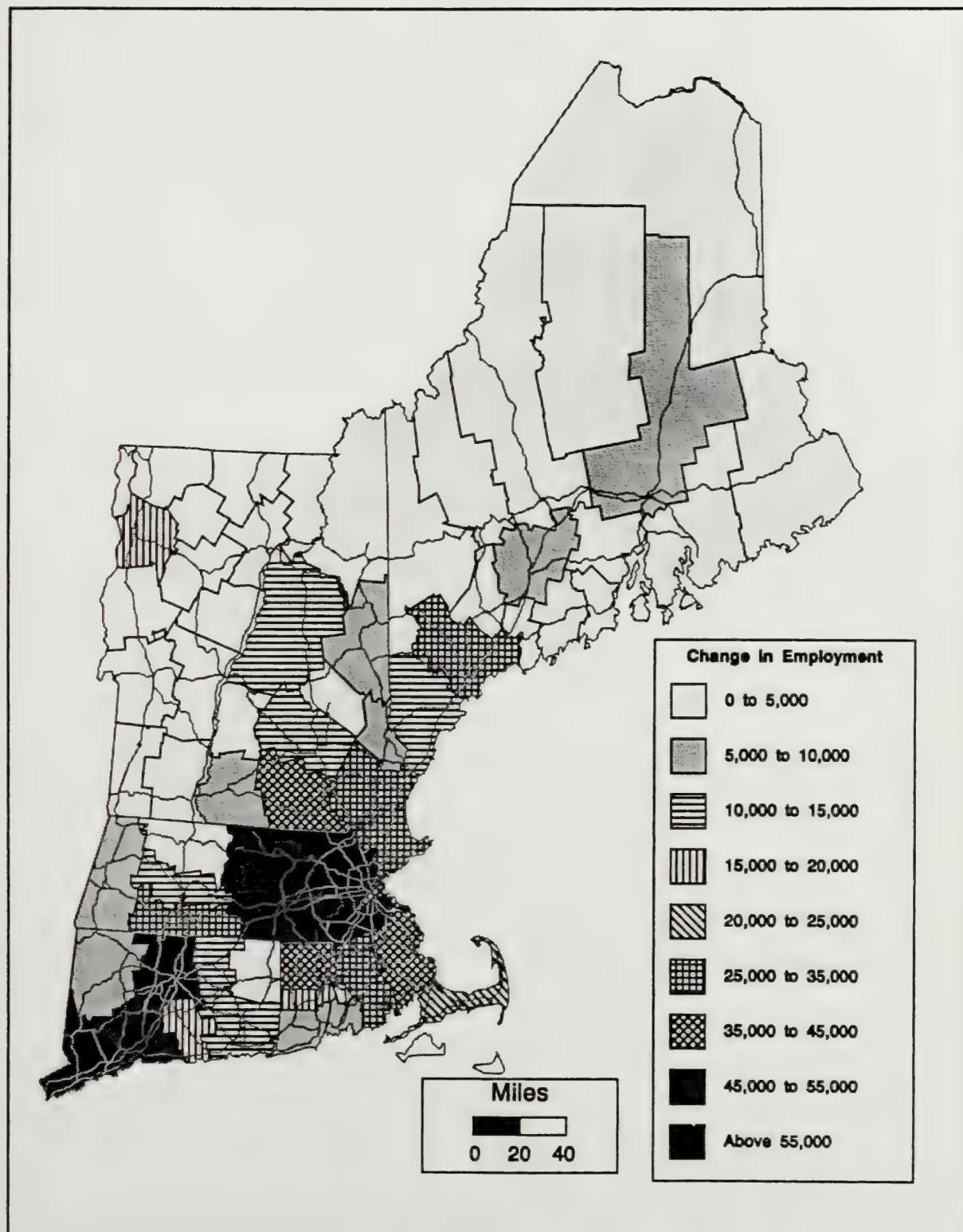


Figure 7.12 Concentration of Freight Generating Employment
Counties with Companies of More Than 1,000 Employees

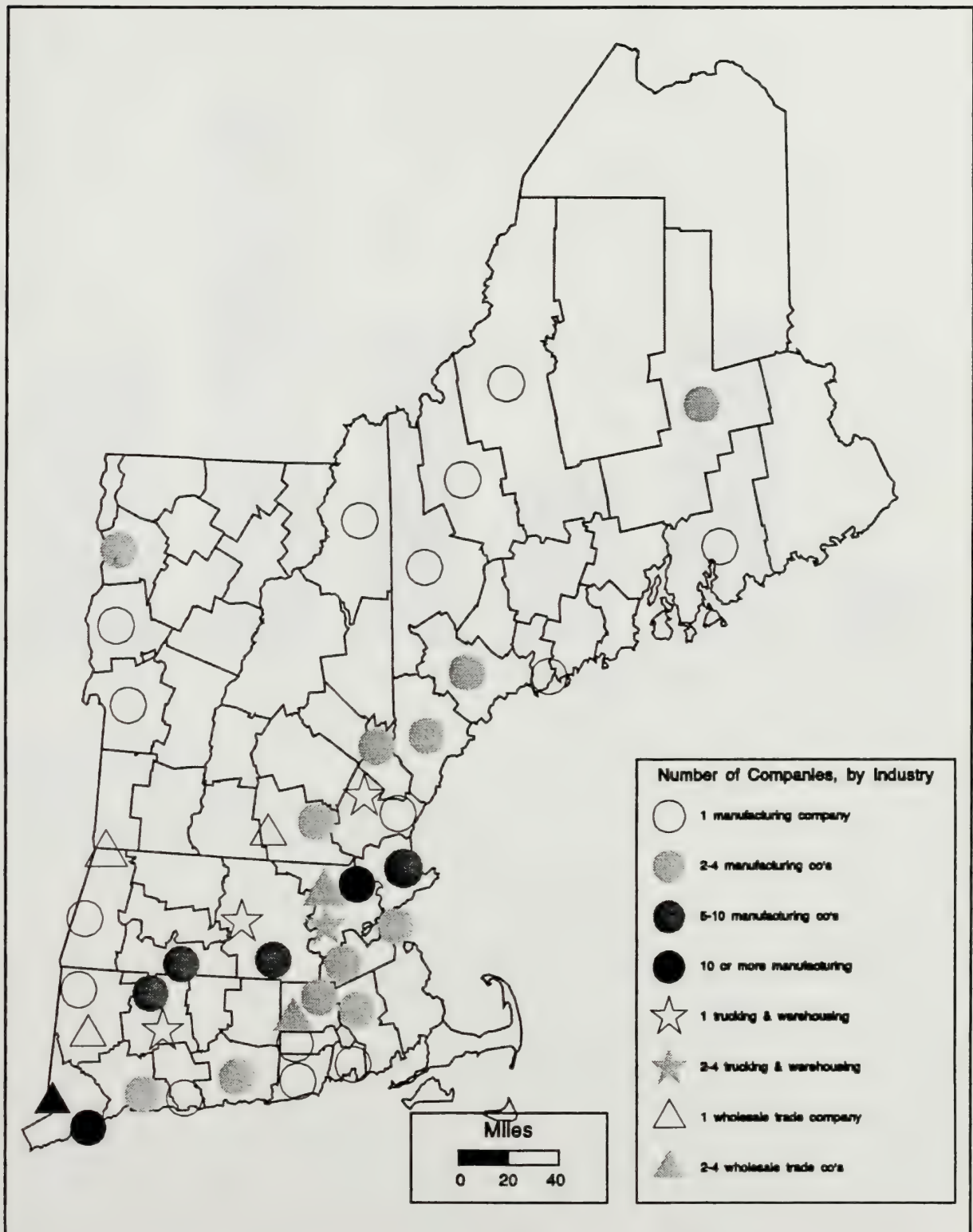


Figure 7.13 Federal Defense Spending, 1992
Share of GSP per State

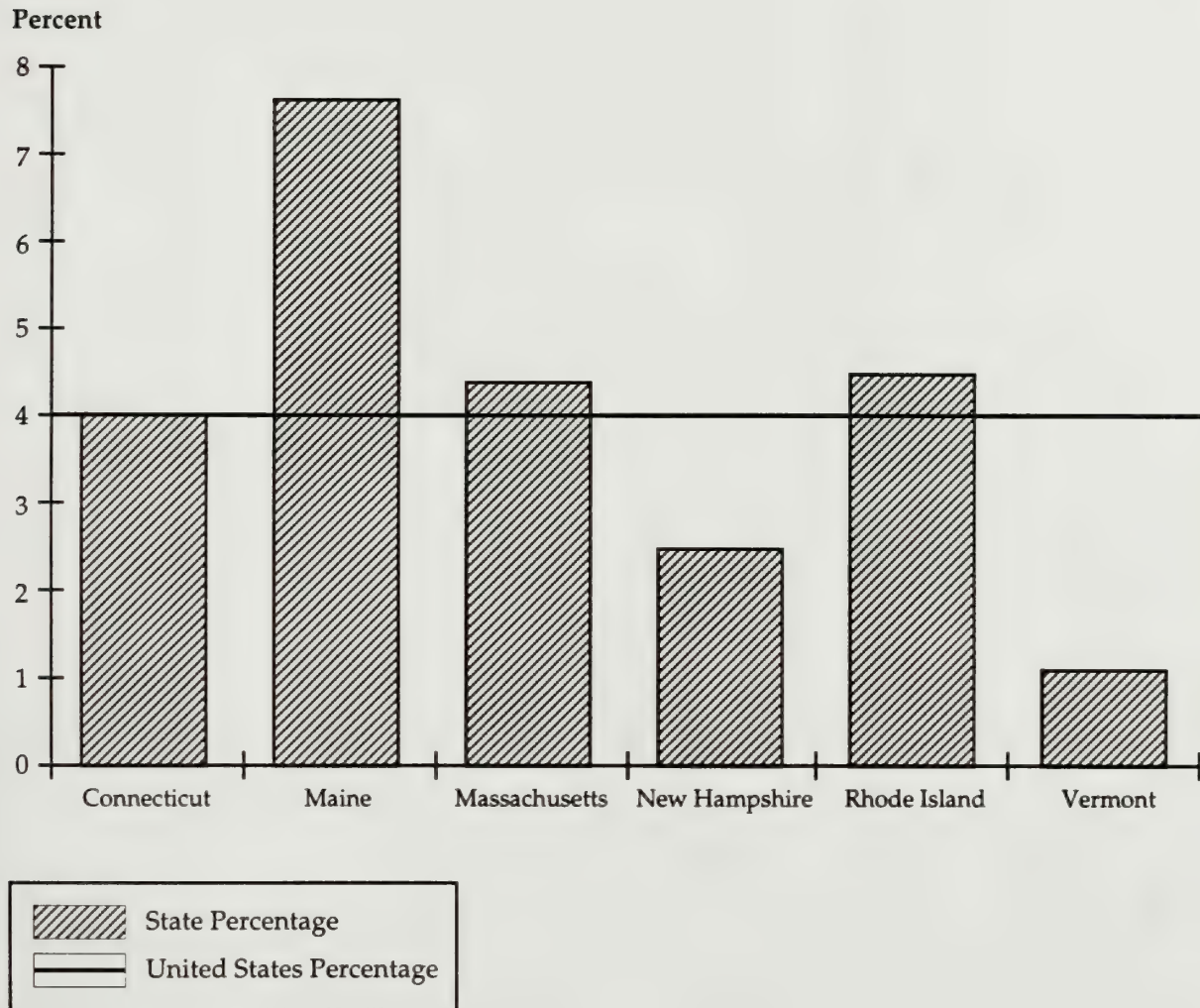
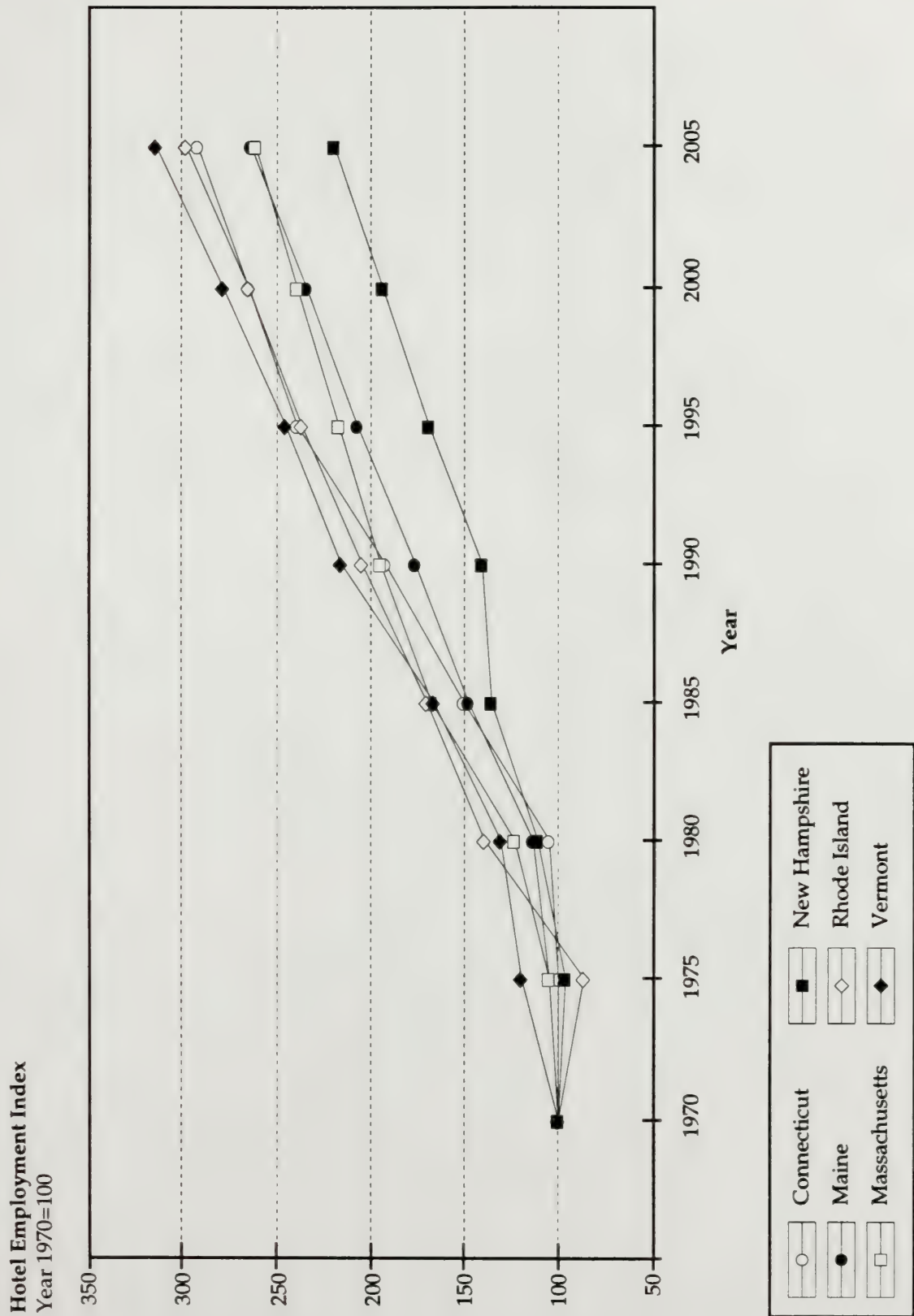


Figure 7.14 Hotel Employment Index, 1970-2005
As an Indicator of Tourist Activity



Part III. Environmental

8.0 *Air Quality and Energy*

Chapter 8.0 – Air Quality and Energy

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8.1 Ozone Non-Attainment Status by County
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8.3 Distribution of Anthropogenic VOC Emissions by Source Category

8.0 Air Quality and Energy

■ 8.1 Key Issues/Focus

This chapter addresses both air quality and energy issues related to transportation planning. The presentation of these issues was combined since key overlapping elements in each area involve improvements in automobile technology to reduce emissions and/or fuel consumption. Since the automobile is by far the major contributor to transportation-based pollution and fuel consumption, it made sense to combine this discussion. Chapter 9.0 addresses other major environmental issues.

Eleven issues have been identified as being "key" and "cross-cutting" with respect to the consideration of air quality and energy issues for the six New England states:

1. **Pollutants.** Ozone is the pollutant of primary concern and that has the highest and most widespread number of non-attainment areas of the National Ambient Air Quality Standards (NAAQS). Violations of the carbon monoxide and particulate matter standards also exist but are much more localized in nature.
2. **Transport.** The 12 northeast states plus the District of Columbia have been designated as an "ozone transport region" under the Clean Air Act Amendments of 1990. Under certain summer meteorological conditions, multi-day ozone episodes exist whereby high levels of ozone pollution are formed in the Midwest and in the southern and central portions of the region and are pushed up the coast by southwesterly winds. Especially in southern New England, this transport phenomenon exacerbates ozone exceedances that would still otherwise occur on a metropolitan area basis.
3. **Regional Coordination.** Two organizational mechanisms already exist to help states develop and implement air pollution control strategies on a coordinated regional basis. These are the Northeast States for Coordinated Air Use Management (NESCAUM) and the Ozone Transport Commission (OTC). NESCAUM is a voluntary organization consisting of the six New England states plus New York and New Jersey. The OTC was established under the 1990 Clean Air Act and provides a mechanism whereby the twelve member states and the District of Columbia can petition EPA and have a strategy become mandatory.
4. **Strategy Emphasis.** There is a widespread belief, but not consensus, that the past priority of emphasizing the implementation of stationary source controls no longer is appropriate. Considerably increased attention in the current round of air quality planning is being given to the control of mobile and area sources. Within mobile sources, primary attention is being given to cleaning up the vehicles and the fuels that are being used. Much less attention is being devoted to traditional Transportation

Control Measures (TCMs) than in past rounds of air quality planning. Employer-based Trip Reduction Plans (as well as all forms of TCMs) were strongly encouraged by the new CAAA but are encountering resistance at the state level. Only Connecticut is moving forward with a mandatory Employee Commute Option (ECO) program, but this is being limited to the Fairfield County area where it is required because this portion of the state is designated as a severe ozone non-attainment area. In general, states have had less difficulty than anticipated in meeting their 15 percent required reductions in hydrocarbon emissions primarily through projected improvements in vehicles and fuels, and this has lessened the pressure to undertake implementation of TCMs.

5. **Adoption of the California Low Emission Vehicle (LEV) Standards.** A major issue is the means through which new technology vehicles will be introduced into the passenger and freight vehicle fleets. On January 31, 1994, the members of the Ozone Transport Commission voted 9 to 4 under provisions of the Clean Air Act to request the Administrator of the Environmental Protection Agency to require adoption of California's Low Emission Vehicle (LEV) emission standards within the 12 northeast states and the District of Columbia. The Administrator has a period of nine months from the date of formal receipt of the request to approve, disapprove, or partially disapprove and partially approve the recommendation. The EPA Administrator also can recommend "equal or more effective actions" that could be taken by the northeast states.

Previously, the Governors (or their designees) of the OTC states, with the exception of Connecticut, had signed a Memorandum of Understanding in 1991 agreeing that each state would implement the California LEV program, an option available under the CAAA. At this time, however, only Massachusetts and New York have passed the necessary implementing legislation or adopted the necessary implementing regulations. Maine, New Jersey, and Maryland also have passed legislation, but containing conditional implementation provisions that have not yet been met. Adopting the California LEV program within the northeast has become much more controversial than expected, with lawsuits pending in both Massachusetts and New York. The center of the controversy is the mandatory requirement to phase in the production of "Zero Emitting Vehicles" or ZEV in the form of electric vehicles. The American Automobile Manufacturers Association (AAMA) has proposed an alternative set of emission standards that they would be willing to adopt on a national basis that would replace northeast states opting into the California LEV standards. In addition, the recently announced partnership between the federal government and the American automobile manufacturers in forming the Clean Car Coalition potentially could have an effect on national vehicle emission standards.

There have been extensive discussions throughout the fall and winter involving the states, EPA, and the automobile industry concerning the relative merits of the California LEV standards and the alternative emission standards proposed by the American automobile manufacturers. It is likely that these negotiations will continue, and even broaden, as a result of the OTC vote.

6. **Clean and Alternative Fuels.** The CAAA contains a clean fuels program for vehicle fleets and the National Energy Policy Act of 1992 contains a vehicle fleet alternative fuels requirement. Emphasis is being given in the New England states to implementing a coordinated program, although participation by Vermont and Maine may not be required since these two states do not contain urban areas that are in excess of 250,000 population. The coordinated regional strategy being considered would require certain fleets covered by the CAAA and Energy Policy Act requirements to purchase dedicated alternative fuel vehicles certified to EPA's new standard for Inherently Low Emitting Vehicles (ILEV). An ILEV would be an alternatively fueled vehicle but not necessarily a ZEV or electric vehicle.
7. **Time Schedule.** State Implementation Plans (SIPs) for the CAAA were due on November 15, 1993, demonstrating a 15 percent reduction in hydrocarbon emissions by 1996 from 1990 baseline conditions. All of the New England states (as well as states throughout the country) have had difficulty meeting the time schedules defined in the CAAA. Various analytical requirements have proven more complex than originally anticipated, and it also has been more difficult to develop consensus to implement control strategies than had been anticipated.
8. **Conformity.** Section 176 (c) of the CAAA requires that a state's transportation plans, programs, and projects "conform" with that state's air quality State Implementation Plan (SIP). This conformity is achieved by demonstrating that the emissions associated with a transportation plan, program, or project do not exceed the emissions "budgeted" for mobile sources in the State Implementation Plan. This is a much more analytical and rigorous test than the previous definition of conformity and represents a significant change in current transportation practice. This new conformity requirement is viewed by state departments of transportation as the largest area of concern in the new Clean Air Act. In New England, it raises particular questions of consistency in VMT growth and other assumptions.
9. **Growth.** The CAAA requires that emissions associated with growth be "offset" by transportation and other measures contained in the SIP. This is a much tougher requirement in high growth regions of the country than it is in New England which is experiencing relatively low growth rates. Consequently, "growth management" strategies are not receiving major attention as a long-term air quality strategy. At the same time, the consistency of environmental, economic, and mobility programs is recognized as an important overarching regional objective. In brief, this is the "sustainability" objective and it is this criterion that is driving efforts such as the Consortium for Regional Sustainability based at Tufts University.
10. **Imposition of Highway Funding Sanctions.** In contrast to the traditional partnership between FHWA and the states in administering the federal highway program, the Clean Air Act establishes an essentially regulatory role for the Environmental Protection Agency. A central enforcement mechanism for EPA is both the threat and imposition of sanctions on federal highway funds if a state is found to be in noncompliance with provisions of the Clean Air Act. These sanctions can be imposed on both a discretionary and mandatory basis and are used as a strategic enforcement tool by EPA. A review of the history of the Clean Air Act shows that the existence of

these highway funding sanctions has proven very effective in "motivating" states to comply with various mandatory provisions of the Clean Air Act. For example, Illinois recently has passed under the threat of EPA imposed sanctions legislation for an enhanced vehicle inspection and maintenance program. Similar legislative action is reported to be underway in Indiana for the same reasoning. The situation in California, though, is very different. California's state legislature has refused to adopt a vehicle inspection and maintenance program that EPA is willing to determine to be in compliance with the agency's implementing rulemaking for I/M programs despite extensive efforts throughout the fall and winter to develop comprehensive options that would be acceptable to both California and EPA. The California legislature, however, has passed a bill (SB 629) that would enhance that states existing decentralized test-and-repair Smog Check program. While EPA has determined that this bill is not satisfactory, the agency also has decided as a result of the January 1994 Los Angeles earthquake not to proceed at this time with the imposition of "accelerated" highway sanctions. The agency's reasoning for this action is that the state already has incurred significant economic costs as a result of the earthquake and that full highway funding is required to rebuild those freeways in the Los Angeles region that were extensively damaged by the earthquake. There are two important implications of this situation. First, if sanctions are not pursued by EPA in California, then it may be difficult for EPA to impose highway funding sanctions in other states as well. Second and more importantly, legislation that already has been passed by the New England states and others to meet requirements of the Clean Air Act could be revoked and existing commitments cancelled. The most immediate target for this kind of reaction would be enhanced vehicle inspection and maintenance programs.

11. **Legal Challenges.** Clean Air Act planning, especially as it relates to transportation, increasingly is being performed under the threat, if not the actual existence, of legal suits filed by both environmental groups and private industry. For example, the American automobile manufacturers are suing the states of Massachusetts and New York regarding the adoption by those two states of California's Low Emitting Vehicle (LEV) program. The Environmental Defense Fund, Conservation Law Foundation, and other environmental groups are closely monitoring state responses to conformity and other transportation-related provisions of the Clean Air Act. The development of transportation proposals increasingly is being undertaken within a framework of protecting an agency from either existing or future legal challenges. A region-wide adoption of assumptions and analysis methodologies that are consistent and technically defensible would reduce the ability of a group to challenge the results and procedures of a state's transportation air quality planning process.

■ 8.2 Methodology

The inventory work was directed toward accomplishing the following objectives:

1. Identify air quality and energy issues that are of a regional (i.e., interstate) concern;
2. Obtain basic data on the nature of the air quality and energy problems within each state and regionally, including the relative importance of stationary and mobile sources;
3. Document the set of mobile source air quality control and energy strategies that are being implemented or that are under investigation in each state, with an emphasis on identifying those strategies that may have regional significance;
4. Identify important underlying assumptions that are guiding the transportation portions of each state's air quality and energy efforts;
5. Summarize principal air quality and energy requirements of national legislation (CAAA, ISTEA, and EPAct) that will have an important influence on the implementation of regional transportation initiatives; and
6. Obtain those air quality and energy data necessary to perform the NETI Task 3 Trends Assessment.

Since important regional air quality and energy initiatives already are underway, contacts initially were made with the following organizations:

- NESCAUM (Northeast States for Coordinated Air Use Management);
- U.S. Environmental Protection Agency (EPA) Region I;
- U.S. Department of Energy Region I;
- Ozone Transport Commission (established by the Clean Air Act Amendments of 1990 for the northeast states); and
- Consortium for Regional Sustainability (CRS) – Tufts University.

Staff of the above organizations provided both a regional overview and an introduction to developments within individual states. They also provided a set of appropriate state-level contacts, supplementing the contacts that were already known by the project team. Technical staff in each of the six states were then subsequently contacted. These state contacts were with persons having an in-depth knowledge of their respective state air quality programs and were directed toward obtaining the following information:

- Nature and seriousness of the air quality problem for each state and regionally;
- Emission inventory data;
- Trends in air quality monitoring data;
- SIP mobile source strategies (vehicle, fuel, and transportation control measure (TCM)) that are either committed to or under development;
- Key issues of state and regional significance;
- Impact of growth on the ability to demonstrate attainment with the National Ambient Air Quality Standards (NAAQS), and the proposed role for growth management strategies;
- Status of emissions trading and market-based incentives; and
- Existence of state laws or regulations that go beyond the requirements of the Clean Air Act.

■ 8.3 Existing Conditions

8.3.1 Non-Attainment Status

The current National Ambient Air Quality Standard for ozone is a one hour concentration of 0.12 parts per million (ppm), averaged over a three-year period. The expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm must be equal to or less than one for an area to be in attainment of the standard. The ozone standard previously was 0.08 ppm but was raised to 0.12 in 1979. There is increasing evidence, though, of adverse vegetation and human health impacts with ozone levels equal to the current federal standard.

Prior to 1990, an area was simply designated as being in either attainment or non-attainment, with all non-attainment areas having the same mandated date for meeting the National Ambient Air Quality Standards. This approach, however, did not take into consideration the degree of the non-attainment severity. Areas only slightly above the standards had a much easier problem than areas that were far in excess of the standard.

One of the significant changes incorporated in the Clean Air Act Amendments of 1990 was to classify areas by the severity of non-attainment, with each classification having a different attainment schedule and also different requirements. Ozone non-attainment areas are classified into one of five categories: marginal, moderate, serious, severe, and extreme. The attainment dates are 1993 for marginal areas, 1996 for moderate areas, 1999 for serious areas, and 2010 for extreme areas (only Los Angeles). Severe areas are further subdivided

into two classifications, having attainment dates of 1995 and 1997 respectively. Figure 8.1 maps the ozone non-attainment status by county for New England.¹ In some cases, actual designations do not correspond precisely to county boundaries. Table 8.1 summarizes the definitional classification of non-attainment areas. Table 8.2 indicates the difference in major control strategy requirements applying to each non-attainment category.

A second important change introduced by the Clean Air Act Amendments of 1990 is the treatment of interstate ozone transport. The Act authorizes the creation of Ozone Transport Regions and created an Ozone Transport Commission for the 12 northeast states and the District of Columbia. The implementation of enhanced vehicle inspection and maintenance (I/M) programs by the six New England states is affected by this OTC designation.

Normally, enhanced vehicle I/M is required only in serious and above non-attainment areas. However, within a designated ozone transport region, enhanced vehicle I/M is required in each metropolitan statistical area with a population of 100,000 or more regardless of the non-attainment designation. In New England, this expanded vehicle I/M coverage directly affects the Burlington, Vermont and Manchester, New Hampshire urban areas.

All of Vermont is in attainment of the ozone standard. The state, though, is part of the northeast ozone transport region. The most sensitive area for ozone pollution is Bennington County which is influenced by transport from the Albany (NY) region. Additionally, the standard is met by only a small margin, with daily maximum levels tending to fall only slightly below the regional average for the eight northeastern states. Due to the importance of quality of life issues such as air quality to the maintenance of the state's service economy, Vermont embraces many requirements of non-attainment status in order to maintain attainment status and control VMT growth. Vermont is in attainment of the carbon monoxide standard. The state also is in attainment of the PM-10 particulate matter standard, although they are still technically in non-attainment of the old TSP standard.

In New Hampshire, the Portsmouth-Dover-Rochester and Nashua areas are designated as serious ozone non-attainment areas. The Manchester urban area is designated as being in marginal non-attainment of the ozone. There are no carbon monoxide or PM-10 non-attainment areas in New Hampshire.

Maine is in attainment of the carbon monoxide standard, but the Presque Isle area is classified as a moderate non-attainment area for PM-10 particulate matter. For ozone, the seven southwestern counties, including the Portland urban area, are in moderate non-attainment while Hancock and Waldo counties are classified as being in marginal non-attainment. During the summer of 1993, there were four violations of the ozone standard.

^{1/} Not shown on Figure 8.1 are portions of Maine and New Hampshire where air quality monitoring data are insufficient to make a determination of attainment status.

Connecticut experiences the most severe ozone air pollution of the six New England states. All of the towns in Fairfield County, except Shelton, plus the towns of Bridgewater and New Milford in Litchfield County are designated as a severe ozone non-attainment area with the remainder of the state classified as a serious ozone non-attainment area. Nationally, only the Los Angeles metropolitan area has a worse ozone problem. Fairfield County is part of the New York City metropolitan region and any solution must also involve the states of New York and New Jersey. The Fairfield County area also is classified as a moderate (≥ 12.7 ppm) carbon monoxide non-attainment area. The Hartford-New Britain-Middleton region is in violation of the carbon monoxide standard and is classified as being a moderate (≤ 12.7 ppm) non-attainment area. The City of New Haven is classified as a moderate PM-10 non-attainment area.

The entire state of Massachusetts has been designated as being in serious non-attainment of the ozone standard. For air quality planning purposes, Massachusetts has been divided into separate western and eastern areas. The western area includes Springfield and the surrounding portions of the state. The eastern region is referred to as the Boston-Lawrence-Worcester non-attainment area, but also includes portions of southern New Hampshire and Maine. The Boston region has been designated as a moderate carbon monoxide non-attainment area. All of Massachusetts is in attainment of the PM-10 standard.

Like Massachusetts, the entire state of Rhode Island is designated as being in serious non-attainment of the ozone standard. For planning purposes, the entire state and the Providence MPO are identical. Rhode Island transportation officials view this violation as "technical" in nature and largely due to external transport, since no violations have been reported in Providence for several years and only a handful of violation days have been recorded in rural areas of the state. Rhode Island is in attainment of the PM-10 standards. Providence is a maintenance area for carbon monoxide.

8.3.2 State Laws and Regulations

Each state has its own air quality statutes and regulations. For the most part, these establish the state air quality or environmental agency and grant this agency permitting, regulatory, and enforcement authority. These agencies also may establish state-specific air pollution standards which may be more stringent than the corresponding federal standard or may cover pollutants for which federal standards do not yet exist. For all practical purposes though, the federal standards still represent the primary controlling regulation in each of the six New England states.

Maine established an ozone one hour standard of .08 parts per million (ppm) consistent with the original federal standard established in 1971. This compares to the current federal standard of .12 ppm. This state standard, though, really represents a goal; a timetable for attainment has not been established and an enforcement mechanism for violations does not exist. Maine also has a lower annual PM-10 standard, 40 ug/m^3 compared to the federal standard of 50 ug/m^3 .

Vermont has established additional standards for air toxics. Their standards for lead and particulate matter are also more stringent than the corresponding federal standards. Rhode Island also has established its own air toxic standards, but these are aimed primarily toward stationary sources.

8.3.3 Emissions Inventory

Ozone, often referred to as smog, is a measure of the photochemical reaction between volatile organic compounds (VOCs or hydrocarbons) and nitrogen oxides (NO_x). This is both a continuous and complex "cooking" process that can last for several days during a summer ozone "episode." Given the close proximity of a number of urbanized areas within the northeast, pollution created from one urban area or state's emissions can be transported during these episodes across urban areas located in the Midwest and then move in a generally northeasterly direction up the coast. High levels of ozone are formed during the heat of the day and dissipate during the coolness of the night. Given this transport phenomena, pollution created from one urban area can add to the pollution resulting from an earlier time from another urban area.

The formation of ozone can be either VOC or NO_x "limited" depending on the ratio of VOC and NO_x emissions. Current thinking is that the ozone problem in the northeast is controlled more by NO_x emissions than it is by VOC emissions, implying that it is more important to control NO_x than VOC emissions. This conclusion, though, is based on earlier ROMNET (Regional Oxidant Model of NorthEast Transport) modeling. More current, accurate, and detailed modeling presently is being developed using an adaptation of the Urban Airshed Model (UAM).

Given this uncertainty, NESCAUM and the Ozone Transport Commission have developed a balanced effort aimed at controlling both VOC and NO_x emissions. The Clean Air Act Amendments of 1990, however, are cast primarily toward the reduction of VOC or hydrocarbon emissions. Specifically, states are required to reduce their 1990 baseline hydrocarbon emissions by 15 percent by 1996, and by a subsequent three percent per year until attainment is achieved. Trading of VOC and NO_x emissions will be allowed in the three percent per year reductions but is not allowed in achieving the initial 15 percent reductions in hydrocarbon emissions.

Emissions result from stationary sources such as factories and power plants; area sources such as dry cleaners, small industrial operations, and home usage, and transportation or mobile sources. Reactive hydrocarbon emissions from natural or biogenic sources also may be an important contributor to the formation of photochemical oxidants but are not included in the calculation of the Clean Air Act's mandated emissions reductions.

Mobile sources most commonly are thought of as coming from the exhaust tailpipe of the automobile. Automobile evaporative emissions, though, also can be significant and result from a number of different fuel system sources. On-road mobile sources also include trucks, motorcycles, and buses. Off-road mobile sources include aircraft, railroads, and marine operations. Fueling operations also result in evaporative emissions and can be

classified as either a mobile or an area source. These fueling evaporative emissions occur during any transfer of fuel, including tank trucks and from the pump into a vehicle's tank.

Mobile sources produce approximately 90 percent of total carbon monoxide emissions and 50 percent of total VOC emissions. Approximately two-thirds of mobile source VOC emissions may be from highway mobile sources. Diesel trucks, in particular, are important sources of NO_x and air toxics. The total mobile source contribution to NO_x emissions can be on the order of 70 percent, with 50 of this 70 percent resulting from highway mobile sources.

1990 baseline hydrocarbon emissions for each of the six New England states are summarized in Table 8.3 and in Figures 8.2 and 8.3. As shown, the majority of emissions are from Connecticut and Massachusetts, the two states having the highest concentrations of population. The distribution of hydrocarbon emissions by type of source follows the general pattern, but with less industrial states having a relatively higher proportion of mobile source emissions.

■ 8.4 Mobile Source Strategies

The transportation strategies that have been adopted or that are under consideration by the six New England states for air quality and energy purposes are summarized in Table 8.4.

Adoption of the California LEV standards has been agreed to by all of the OTC states, except Connecticut, under a Memorandum of Agreement but at this point have been legally adopted among the New England states only by Massachusetts. Maine has adopted the LEV program under the condition that it will be implemented only if certain trigger points are met in terms of implementation by other states. Specifically, these include adoption by Massachusetts, Connecticut, and one other New England state and an overall adoption by states representing at least 60 percent of the vehicles registered within the ozone transport region. Within the larger NESCAUM region, the California LEV program also has been adopted by New York and conditionally by New Jersey. Of the additional states within the OTC region, Maryland also has adopted the California LEV program on a conditional basis. Overall, the California LEV program has proven to be more controversial than anticipated with lawsuits from the auto manufacturers pending in Massachusetts and New York. A key concern is the mandated (ZEV) or electric vehicle production requirements.

In response to the adoption of the California LEV standards by the northeast states and the District of Columbia, the American Automobile Manufacturers Association (AAMA) has proposed an alternative which would eliminate the ZEV requirement, and adopt somewhat higher LEV emission rates at a later time. In trade for the AAMA proposal being accepted by the OTC states and EPA, the automobile manufacturers would pledge to produce these cars throughout the country. In effect, the AAMA proposal would replace both the Tier I and Tier II emission rates now provided for in the Clean Air Act.

At this time, the OTC studies have not found the AAMA proposed alternative emission standards to be acceptable. A vote was taken by the Ozone Transport Commission on January 31, 1994 to petition EPA under terms of the Clean Air Act to require all northeast states and the District of Columbia to adopt the California LEV standards. In the nine months that the EPA Administrator has to rule on this request, it is almost certain that extensive negotiations will take place to determine if there is an alternative that is both acceptable to the automobile industry and equally effective in meeting the pollution reduction objectives of the Clean Air Act.

Since the six New England states are within a designated ozone transport region, an enhanced vehicle inspection and maintenance program is required in each non-attainment area and within each urban area greater than 100,000 in population regardless of attainment designation. Such programs either have been enacted or are in the process of being adopted in each state. The Connecticut, Massachusetts, and Rhode Island programs are statewide in coverage. The New Hampshire program covers Manchester and the four counties located in the southeastern region of the state: Hillsborough, Rockingham, Strafford, and Merrimack. The Maine I/M program covers the seven southwestern counties that are in moderate non-attainment of the NAAQS. The Vermont program will be applicable just to Chittenden County, which includes the Burlington urban area. Each program is designed to have biennial inspections. An important difference in the six programs is the weight limit of the vehicles to be inspected, with New Hampshire, Connecticut and Maine including heavy duty vehicles. The "model" EPA program covers vehicles weighing up to 8,500 lbs. of gross vehicle weight (GVW). The Maine and Connecticut programs now include vehicles up to 10,000 lbs. GVW. Connecticut, however, is currently considering increasing its weight limit to 26,000 lbs. GVW. The New Hampshire program already covers vehicles weighing up to 26,000 lbs. GVW. In Massachusetts, an inspection and maintenance program for heavy duty vehicles is being considered as a contingency measure for the 1996 15 percent VOC reduction SIP. The Vermont program affects 1975 or newer vehicles of less than 10,000 lbs. GVW. The Maine I/M program also differs from those being adopted in the five other New England states in that vehicles driven less than 5,000 miles per year are exempted and initial implementation phase-in will start in July 1994, six months earlier than required by EPA.

Under the Clean Air Act, reformulated fuel is required in the severe and extreme ozone non-attainment areas, which includes southwestern Connecticut. Other areas, however, can "opt-in" to the use of reformulated fuel and each of the six New England states has done so as part of a coordinated NESCAUM and OTC effort. Reformulated fuel is being introduced in two phases with Phase I starting in 1995 and Phase II starting in the year 2000.

Stage II vapor recovery constitutes the use of special hoses and other equipment installed at gasoline stations that capture refueling vapors and prevent these vapors from escaping into the atmosphere. This program is required in all moderate and above ozone non-attainment areas, and has been adopted in all of the New England states except Maine. In Maine, initial proposals included Stage II vapor recovery as one of the measures necessary to achieve the 1996 15 percent reduction in VOCs, contributing 4.6 of the 40.5 daily tons

needed. Adoption of Stage II, however, currently is on hold and consideration is being given to the use of other measures as a substitute for Stage II.

Transportation Control Measures (TCMs) have received considerable attention in previous rounds of transportation air quality planning. In the 15 percent VOC reduction SIPs submitted on November 15, 1993, however, TCMs were not included in any of the New England state submissions except for the mandated Employee Committee Option (ECO) program in Connecticut. The primary reason for this lack of TCMs was that the respective emission analyses showed that TCMs were not as necessary as had been expected to achieve the 15 percent required reduction in VOC emissions.

States and urban areas throughout the country also have found that the adoption of TCMs has proven to be much more controversial than expected. For example, Massachusetts devoted considerable effort to the development of a comprehensive TCM strategy but was not successful in generating the support from private business needed to move the program forward. State officials, though, feel that such measures will be required as part of the November 1994 SIP which must demonstrate a three percent per year reduction in VOC emissions (net of growth) between 1996 and 1999. TCMs also are being considered as a means of offsetting emissions increases associated with growth in VMT. Massachusetts, however, has committed to implementing a variety of TCMs as part of previous SIP submittals and as part of the Central Artery/Tunnel Mitigation Plan. These include a network of high occupancy vehicle (HOV) lanes, additional transit fringe parking, traffic flow improvements, and an IVHS-based (Intelligent Vehicle Highway Systems) incident management demonstration program.

Other New England states also have made strong commitments to the implementation of travel demand management strategies even though TCMs, per se, may not been included in the November 1993 SIP submissions. Connecticut has strong transit, ridesharing, and park-and-ride programs and views TCM type policies as a viable means of controlling growth in vehicle miles of travel. New Hampshire has recently completed a transportation master plan for the redevelopment of Pease Air Force Base. The master plan commits to implement transportation control measures as part of a mitigation program to control future emissions. The Pease mitigation program includes the development of a Transportation Management Association which will take the lead in implementing ridesharing, parking management, flexible work hours, promoting alternative fuel vehicles, and pedestrian and bicycle route development at the airport. The Pease Development Authority in conjunction with other state and local agencies also will implement one way toll operations, high occupancy vehicle lanes, and transit services. These transit services will include an express shuttle bus to Portland, transfer facilities at Pease and Portland, increased service on existing bus routes, new feeder service, and expanded park-and-ride facilities. Finally, the Pease mitigation plan also recommends alternatives for future commercial and commuter rail service to serve Pease.

Employer-based transportation demand management programs have received extensive emphasis in recent years as a natural extension of earlier ridesharing and transportation management organization (TMO) efforts. The rationale is that employee work trips constitute the largest single trip purpose, that parking costs typically represent a significant cost of operation, and that a wide variety of employer-based management actions have

proven effective in influencing the number and timing of single occupant automobile commuting trips. Section 182(d)(1)(b) of the Clean Air Act Amendments of 1990 requires an Employee Commute Option (ECO) program in all severe and above ozone non-attainment areas. Such programs are applicable to employers having 100 or more employees at a work site and must be designed to increase average passenger occupancy (APO) by at least 25 percent above the average occupancy for that area. In compliance with these Clean Air Act requirements, an ECO program is being implemented in the Fairfield, County region of Connecticut.

The objective of the Connecticut ECO program is to increase average passenger occupancy from the current average of 1.19 to 1.49 using measures such as transportation allowances, alternate work schedules, telecommuting, rideshare matching, transit passes, and guaranteed ride home. Employers that either do not submit an acceptable plan or do not implement their plan are subject to civil penalties of up to \$5,000 per day of violation. Penalties, though, cannot be imposed for not meeting the APO target.

ConnDOT will work in partnership with the ECO program by supporting the regional MetroPool transportation management organization, implementing demand management services such as guaranteed ride home, conducting workshops, and establishing a network of employee transportation coordinators. Elsewhere in New England, employer-based transportation management programs have received extensive attention in Massachusetts, are being considered as a required contingency measure in the 15 percent VOC reduction SIP, and will be seriously considered as part of the Massachusetts 1994 SIP submittal.

The new Clean Air Act places major emphasis on the use of market incentives, including the use of emissions trading, banking, and offsets. In these programs, a company or a state that reduces emissions by more than the amount required can use these excess "emission reduction credits" (ERCs) as a substitute for other required emissions reductions. They can be sold to another entity, saved and then used for a future needed emissions reduction, or used to offset a growth of emissions from other sources. To be eligible, emission reduction credits must be quantifiable, excess, permanent and enforceable. Depending on the particular form of a state's rulemaking, mobile sources may be either allowable or not allowable as part of an emissions trading program. Within New England, Massachusetts has made the most progress in developing and implementing an emissions trading program. It is viewed as a critical element in the state being able to attract future economic development. The Massachusetts rule explicitly includes mobile source measures as being eligible for emissions trading, specifying accelerated retirement of vehicles, implementation of clean technology buses or other vehicles, and employee trip reduction as being candidates for consideration. For example, an employee trip reduction program could be implemented earlier than it might otherwise be required and the associated emission reduction credits could be used in an emissions trade. Reductions in stationary source emissions, however, cannot be used as a substitute for required reductions in mobile sources. Initial applications of the Massachusetts rule are expected to be limited to single categories of stationary sources, recognizing the added complexities associated with including mobile sources as part of an emissions trading program.

Both the Clean Air Act Amendments of 1990 and the National Energy Policy Act of 1992 (EPAct) contain important incentives relating to the introduction of clean and alternative

fuels within vehicle fleets. The idea is that these new fuel technologies could be initially phased in with public and commercial vehicle fleets, and then eventually expanded to the general public. The emphasis in the Clean Air Act is on "clean" fuels which may include but would not necessarily require alternative fuels. Vehicles purchased for centrally fueled fleets of 10 or more vehicles located in urban areas in serious and above ozone attainment areas, or in carbon monoxide non-attainment areas, having a population of 250,000 or more must operate on a designated clean fuel. Separate phase-in schedules exist for light and heavy duty vehicles starting in 1998. Emission reduction credits can be obtained for purchasing more vehicles than otherwise would be required. As summarized in Table 8.5, this program affects the states of Connecticut, Massachusetts, New Hampshire, and Rhode Island; specifically the Hartford, New Haven, Providence, Springfield, Worcester, and Boston urban areas. Each of these states is required to develop a SIP amendment describing a clean-fuel fleet program.

While not participating in the national Clean Air and Energy Act fleet programs, Vermont state legislation includes a provision for a state vehicle alternative fuel initiative and the state currently is considering the development of their own demonstration program. In addition, five state agencies and 12 private corporations within Vermont are testing a fleet of nine electric vehicles to gain an improved understanding of the cold temperature operating characteristics of these vehicles.

The National Energy Policy Act of 1992 (EPAAct) contains a similar provision, but is oriented to the use of alternative fuels such as electricity, natural gas, methanol, ethanol, propane, and hydrogen. The emphasis on alternative as opposed to clean fuels is directed at overcoming two specific energy problems. The percentage of oil imported compared to that obtained domestically has increased from 37 to 45 percent over the last twenty years. Similarly, oil's share of all U.S. energy consumption has increased from 53 to 59 percent over the same period. The initial application of the Energy Act's vehicle fleet provisions is narrower than the CAAA's fleet program, focusing on federal and state vehicle fleets in urbanized areas. The federal fleet requirement began in 1993, and the state requirement starts in 1996. EPAAct also applies to fleets of fuel providers starting in 1996. EPAAct fleet requirements can be optionally extended to municipal and private fleets starting in 1999. The size and composition of fleets affected by EPAAct is different than in the CAAA. EPAAct is applicable to fleets of 50 or more vehicles nationwide having 20 or more centrally fueled vehicles under 8,500 lbs. in a single urban area. (The CAAA weight limit for its corresponding vehicle fleet requirement is 26,000 lbs.) Like the CAAA's vehicle fleet program, the Energy Act's provision would directly affect only the states of Connecticut, Massachusetts, New Hampshire, and Rhode Island (Table 8.5).

Especially in a region like New England, there are important opportunities for coordination among the states with respect to the choice of fuel and construction of the supporting infrastructure for refueling and repairs. Four important energy and air quality initiatives are underway in this regard:

- The Department of Energy has initiated a **Clean Cities Program** as a voluntary program to accelerate and expand the use of alternatively fueled vehicles in urban communities and to provide refueling and maintenance facilities required to support the operation of AFVs. Clean Cities is a public/private partnership involving consumers, local utilities,

fuel providers, vehicle manufacturers, conversion companies, fleet operators, environmental agencies, energy offices, transportation organizations, and local officials. The Department of Energy is supporting the program through its promotional efforts and by providing information and technical assistance; new funding, however, is not available. Atlanta, Philadelphia, and the District of Columbia were the first three cities to undertake Clean City demonstration programs. In Massachusetts, a regional program is being developed under the leadership of the Metropolitan Area Planning Council (MAPC) for the greater Boston area.

- Initially proposed by New Jersey, a **Clean Corridors Program** covering the Interstate 95 northeast corridor from Boston to Washington is being developed. The emphasis here is on providing a compatible set of infrastructure support facilities for clean fueled commercial vehicle movement within this major corridor of passenger and freight travel.
- The Northeast States for Coordinated Air Use Management (NESCAUM) is coordinating development of an **Inherently Low Emitting Vehicle (ILEV)** proposal. This program would require a dedicated alternative fuel vehicle strategy in states covered by EPA's and the Clean Air Act's Clean Fueled Fleet requirements. The standard would be specified so that the fuel would have to be an "alternative" rather than a "clean" fuel. An important objective is to overcome the differences in the Clean Air and Energy Act's vehicle fleet programs by implementing a single program that would satisfy the requirements of both acts.
- The **Northeast Alternative Vehicle Consortium (NAVC)** is a public/private partnership organized by the New England Governors' Conference and the Northeast States for Coordinated Air Use Management. The objectives are to encourage the introduction of alternatively fueled vehicles, to use AFVs to promote economic development within the northeast, to assist in the conversion of defense facilities and technologies, and to leverage public and private resources. Participants include state governments, utilities, industries, educational organizations, and public interest groups. Demonstration projects are underway in each of the New England states. Education and outreach projects include the Tour d'Sol S/EV race and Internet computer bulletin board services. Technology projects include the development of advanced automotive components and the use of lightweight composites. Commuter demonstration projects are underway in each of the New England states plus New York City. A military base project is being developed at Hanscom Air Force Base in Bedford, Massachusetts involving the introduction of electric trucks, vans, and buses.

The introduction of electric vehicles is receiving attention in each of the six New England states, with the most developed programs existing in Connecticut and Massachusetts. Within individual states, broader energy efficiency initiatives have received the most attention within Massachusetts. A new state energy plan was developed in 1993 emphasizing the linkage between energy efficiency and economic development. Attention was given to the development of an Energy Technology Development Center as a focus for creating new energy-related jobs and businesses. The Massachusetts Energy Plan also includes a public/private partnership participation in the Federal Transit Administration's Electric "Station Car" Demonstration Program. A fleet of electric vehicles will be leased to

consumers for use in commuting to transit park-and-ride lots. The vehicles can then be re-charged at the transit station while the person is at work.

Regardless of the fuel source, an important interstate issue of concern is the "refueling" and maintenance infrastructure necessary to support alternatively fueled vehicles. For example, while 13 natural gas refueling sites currently exist in New England, seven of these are located in Massachusetts and four are located in Connecticut. Only one of the thirteen is available to the public, other than by appointment. Each fuel requires its own separate and new infrastructure. An advantage of a unified common fuel is that only a single new fuel infrastructure must be constructed on a regional basis. If vehicles are only going to be used within well defined local areas such as electric "town cars," then regional infrastructure considerations may not be a major concern. However, if alternatively fueled vehicles are going to easily move among the six New England states, then the availability of a common supporting infrastructure becomes a much higher priority. The issue of supporting infrastructure for alternatively fueled vehicles is being examined by the Coalition of Northeastern Governors (CONEG).

An important longer-range issue for transportation agencies that is associated with the widespread introduction of alternative fuels is the potential effect on highway fuel taxes, and thus the size of future highway revenues. In general, alternative fuels are either not taxed at all or taxed at a significantly lower rate.

The recently announced federal Climate Change Action Plan has important implications for New England transportation with respect to both energy efficiency and air quality. Nationally in 1990, the use of fossil fuels within the transportation sector represented 35 percent of this country's total energy consumption and produced over 32 percent of U.S. CO₂ emissions. The Climate Change Executive Order issued by President Clinton and Vice President Gore is designed to reduce the production of carbon emissions by reducing the consumption of petroleum-based fuels. The Action Plan contains a package of initiatives that are aimed at curbing the growth in transportation sector emissions by slowing the increasing demand for vehicular travel and enhancing the market for more efficient technology and cleaner fuels. Three of the Action plan's initiatives directly involve transportation: telecommuting, a transportation system efficiency strategy, and the "cash out" of employer provided parking.

1. DOT and EPA will promote the increased use of home-based and satellite location telecommuting through the provision of incentives to employers and employees. A pilot federal telecommuting project will be undertaken with the objective of getting one to two percent of federal employees to work at home at least one day per week. Overall, the U.S. Department of Transportation anticipates a five fold increase in home-based telecommuting by the year 2000. (See Chapter 6.0)
2. The Climate Change Action Plan's transportation system efficiency strategy will promote those measures that are geared specifically at decreasing the demand for vehicular travel. Measures cited in the Action Plan include the use of market mechanisms that encourage people to drive less, parking charges, emission fees, and transit subsidies. Examples of possible new technologies include the development of "virtual" offices based on the use of completely portable communications and

computing equipment. Smart cars, smart transit vehicles, and advanced traveller information systems also will be encouraged. The ISTECA Congestion Mitigation and Air Quality Program (CMAQ) will be evaluated to ensure that the measures being funded by states and metropolitan areas with this funding are contributing to the long-term objective of reducing greenhouse gas emissions.

3. The parking cash out proposal calls for transforming the existing employer-paid parking tax subsidy into an incentive for commuters to use transit, carpool, or find other ways to get to work. Initial application, though, will be limited to only those parking spaces leased by employers from a third party for which the lease allows a reduction in the number of parking spaces without imposition of a penalty. Employer-owned parking is excluded and parking provided by firms having fewer than 25 employees is exempt. Employees who now receive such free parking will have the option of retaining the parking space or accepting either a tax-free transit pass or a cash allowance equal in value to the market cost of the parking space, with the cash allowance being treated as additional taxable income. In both cases, a company will still be able to deduct the cost from corporate taxable income.

■ 8.5 Implications for Next NETI Tasks

The work performed to date provides the data and information necessary for performing Tasks 3, 4, and 5 of the Work Program with respect to the consideration of air quality and energy concerns.

It is proposed that with respect to air quality and energy, the primary emphasis in the Task 3 Forecasting and Trends Assessment be on historical trends rather than future projections. Under the 1990 Clean Air Act, air quality plans are being designed so as to achieve a target inventory level of emissions. States are required to reduce 1996 VOC emissions by 15 percent from a 1990 base inventory, net of new growth. These 1996 State Implementation Plans either have been or are in the process of being submitted for five of the six New England states. Vermont is not required to submit a plan since they already are in attainment of the standards. Plans are due on November 15, 1994 that will demonstrate an additional three percent per year reduction in VOC emissions until attainment is achieved in 1999.

Historical data on fuel consumption and monitored ozone levels are available for each state and can be used to analyze and display trends. In general, ozone levels have either remained relatively stable or declined somewhat. The decreases in monitored ozone levels, though, have not matched the estimated reductions in mobile source VOC and NO_x emissions. This is in contrast to decreases in monitored carbon monoxide levels which have closely tracked the estimated decrease in motor vehicle CO emissions.

Significant effort already has been devoted by NESCAUM and the OTC to the establishment of regional Goals and Objectives (Task 4) for the reduction of emissions from

mobile sources. It is proposed that the New England Transportation Initiative build upon this basis of existing work. This work, though, has been done primarily by the region's state air quality agencies. It is important that the energy and perspectives of transportation and economic development agencies be incorporated for purposes of the New England Transportation Initiative.

Task 5 involves the identification of Issues of Regional Significance. The first section of this chapter summarizes key air quality and energy issues of regional concern. These issues were identified in the discussions held with state and regional officials, as well as emerging from the transportation air quality and energy projects with which the project team have been directly involved. It is proposed that this list serve as the starting point for the air quality and energy portions of Task 5.

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Leah Weiss, Massachusetts Department of Environmental Protection

Laurel Carlson, Massachusetts Department of Environmental Protection

Greg Elder, Massachusetts Department of Environmental Protection

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David Chamberlain, U.S. Department of Energy, Region I

Arthur Marin, Northeast States for Coordinated Air Use Management

Lucy Edmondson, Northeast States for Coordinated Air Use Management

Donna Boysen, Northeast States for Coordinated Air Use Management

Sheila Lynch, Northeast Alternative Vehicle Consortium

Elizabeth Kline, Consortium for Regional Sustainability

David Foerter, Ozone Transport Commission

Tables

Table 8.1 Classification of Areas

	Class	Level - PPM	Attainment Date ¹
Ozone	Marginal	.121 to .137	3 years
	Moderate	.138 to .159	6 years
	Serious	.160 to .179	9 years
	Severe 1	.180 to .190	15 years
	Severe 2	.191 to .279	17 years
	Extreme	.280 and above	20 years
Carbon Monoxide	Moderate	9.1 to 16.4	5 years
	Serious	16.5 and up	10 years
PM-10	Moderate	N/A	12/31/94 (6 years for future areas)
	Serious	N/A	12/31/01 (10 years for future areas)

¹ Subsequent to November 15, 1990, the date of Public Law 101-549, the Amendments of 1990 to the Clean Air Act.

Note: Requirements are cumulative. For example, Moderate areas must also fulfill Marginal area requirements.

Table 8.2 Ozone Non-Attainment Areas: Requirement for Reducing Ozone Emissions

Marginal

Existing SIP Commitments – Implement current SIP commitments; correct SIP deficiencies.

Basic Inspection and Maintenance Program (I/M) – The basic I/M program should be revised to meet the requirements in the SIP, or EPA guidance, whichever is more stringent, if such a program were required before enactment of the CAAA.

Moderate

Basic Inspection and Maintenance Program – The SIP is required to be revised to include a basic I/M program, regardless of whether such a program was required before the CAAA.

State II Vapor Recovery Program – Submit a *Stage II vapor recovery program* by November 15, 1992, that is designed to reduce emissions from refueling at retail fuel outlets for facilities that sell more than 10,000 gallons/month (50,000 gallons/month for independent small businesses.)

Contingency Measures – Contingency provisions in the form of *transportation control measures* (TCMs), or other measures, must be provided for in the 1993 SIP submittal. Transportation control measures are directed toward reducing emission by improving traffic flow, reducing congestion, or reducing vehicle use. These measures will take effect without further action by the State or the EPA at any point that the State fails to meet the 15% emission reduction targets required by 1996, fails to attain the NAAQS target date, or, in the case of areas designated serious and above, fails to meet the 3% annual emissions reductions required after 1996.

Serious

Enhanced Inspection and Maintenance Program – Submit an enhanced I/M program by November 15, 1992, which meets all of EPA's requirements for enhanced I/M.

Clean-Fuel Fleet Program – Areas with a 1980 population of 250,000 or more must revise the SIP by May 15, 1994, to contain a clean-fuel vehicle program for centrally fueled fleets of 10 or more vehicles. The SIP must include programs to ensure the effectiveness of the clean-fuel fleet program.

Table 8.2 Ozone Non-Attainment Areas: Requirement for Reducing Ozone Emissions (continued)

Severe 1 and 2

Vehicle Miles Traveled (VMT) Limitations – *Vehicle miles traveled* is the sum of distances traveled by all motor vehicles in a specified region. Submit specific transportation control strategies and measures by November 15, 1992, for implementation to offset growth in emissions from growth in VMT or number of trips.

Employer Trip Reduction – By November, 1992, submit a SIP revision detailing employer trip reduction (ETR) program for employers of 100 or more employees. The ETR program must be designed to increase the average passenger occupancy by not less than 25% above the average vehicle occupancy for the area. Employer confidence plans are due 2 years after SIP submittal. These plans should "convincingly demonstrate" compliance 4 years after SIP submittal.

Reformulated Gasoline – Beginning in 1995, reformulated gasoline will be mandated in the worst ozone areas, which include the following nine urban areas: Baltimore, Chicago, Hartford (CT), Houston, Los Angeles, Milwaukee, New York City, Philadelphia, and San Diego. Officials of any non-attainment area may "opt-in" to the reformulated gasoline program.

Extreme

Measures for Heavy-Duty Vehicles – Extreme areas may submit additional measures to reduce the use of high-polluting or heavy-duty vehicles during peak traffic hours.

Source: U.S. Department of Transportation, Federal Highway Administration. *Transportation Programs and Provisions of the Clean Air Act Amendments of 1990.*

**Table 8.3 State VOC Emissions by Source Category
(1990 Base Year Inventory in Tons/Day)¹**

State	Point	Area	Mobile	Total Anthropogenic	Biogenic	Total
Vermont	4	19	58	81	0	81
New Hampshire	28	58	140	226	665	891
Maine	20	60	76	156	388	544
Massachusetts	56	403	600	1,059	651	1,710
Connecticut	42	237	257	536	438	974
Rhode Island	25	73	94	192	0	192

¹ Statewide except for Maine which represents only the non-attainment area.

Table 8.4 Implementation Status of Mobile Source Control Strategies

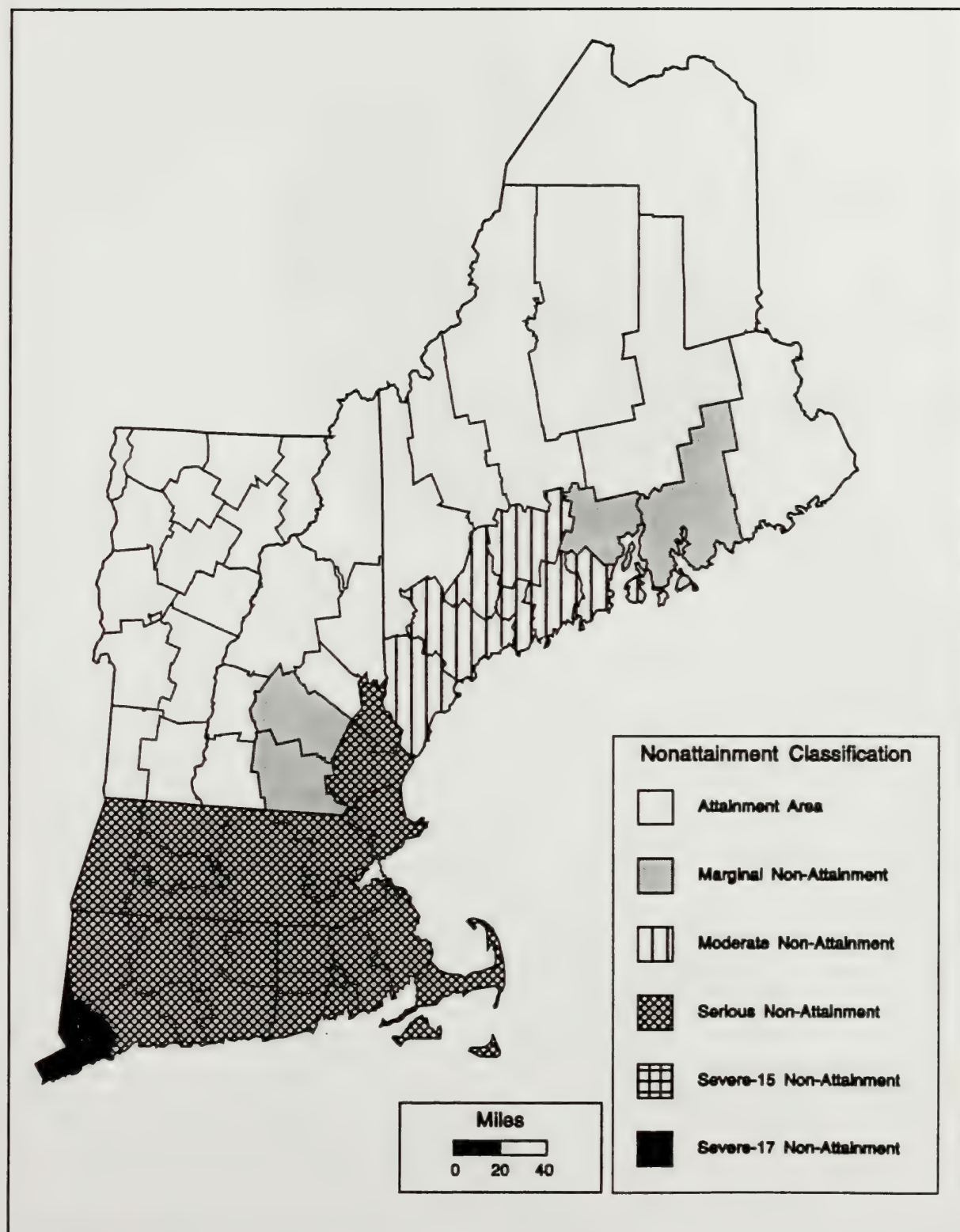
Strategy	Vermont	New Hampshire	Maine	Connecticut	Massachusetts	Rhode Island
California LEV	Support, But No Authorizing Legislation	No	Conditionally Approved	Under Consideration	Approved	No
Enhanced Vehicle I/M	Burlington Area No Authorizing Legislation	Legislation Enacted for Manchester and Non-attainment Areas	Approved and Contractor Selected	Legislation Approved	Legislation Passed	Legislation Passed
Reformulated Fuel	Yes	Yes	Yes	Yes	Yes	Yes
Stage II Vapor Recovery	Yes	Yes	Not yet Adopted	Yes	Yes	Yes
Transportation Control Measures	No	No	No	No	Under Consideration for 1994	No
Employer Programs (ECO)	No	No	No	Fairfield County	Under Consideration for 1994	No
Emissions Trading	Under Consideration	Under Consideration	Under Development	Under Consideration	Yes	No

Table 8.5 Clean and Alternately Fueled Fleet Programs

Program	Vermont	New Hampshire	Maine	Connecticut	Massachusetts	Rhode Island
CAAA Clean Fueled Fleets	No	Yes	No	May Opt Out	Yes	Yes
EPAct Alternately Fueled Fleets	No	Yes	No	Yes	Yes	Yes

Figures

Figure 8.1 Ozone Non-Attainment Status by County



Note: Designation of ozone non-attainment areas is not always consistent with county boundaries.

**Figure 8.2 Distribution of 1990 Anthropogenic VOC Emissions
by State**

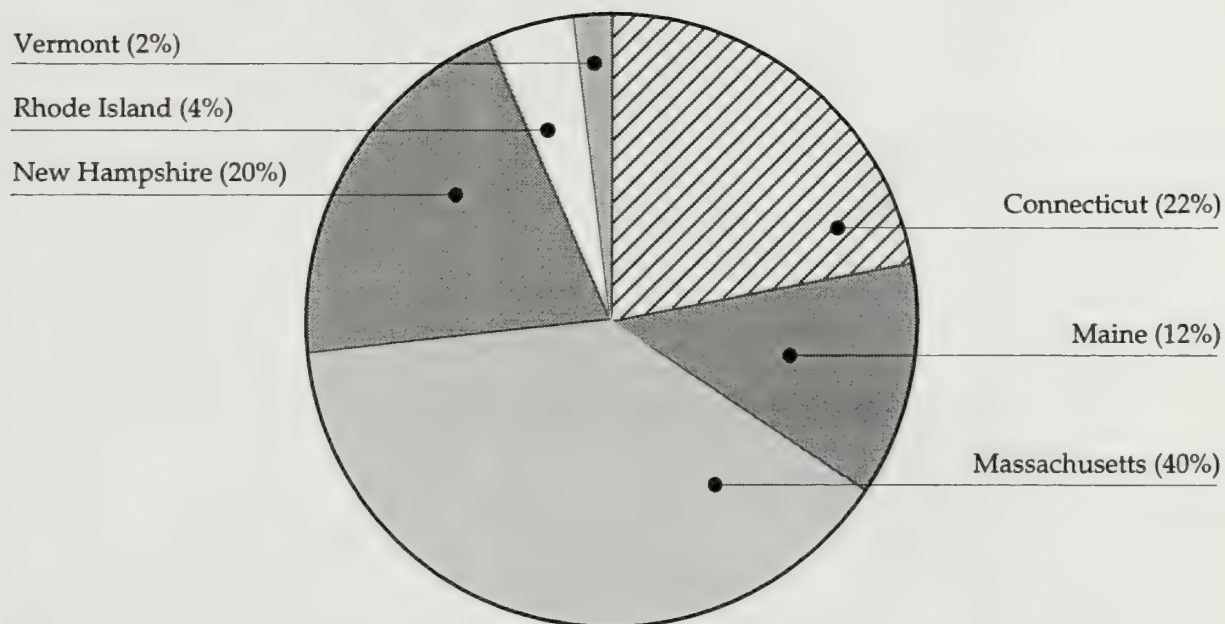


Figure 8.3 Distribution of 1990 Anthropogenic VOC Emissions by Source Category



9.0 *Other Environmental Issues*

Chapter 9.0 – Other Environmental Issues

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9.1 Matrix of Selected Federal and State Regulations
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9.0 Other Environmental Issues

This chapter discusses environmental issues critical to the transportation planning process other than air quality.

■ 9.1 Key Issues/Focus

This report deals with the interface between the regional transportation system and the environment. This interaction takes place both in the real world, where transportation projects affect natural systems and land use patterns, and institutionally, as transportation project planning and development confronts environmental regulations designed to protect the environment.

The interactions work in both directions. In the real world, there is a feedback loop between transportation and land use, each influencing the pattern of the other through successive rounds of infrastructure development and land use growth, with significant consequences for the environment. Institutionally, state and federal regulatory programs affect the way transportation projects are planned and developed, but the regulatory agencies also respond to the need to make the joint system of public planning and regulation more streamlined and rationally responsive to public policy, without compromising the environmental values they were created to protect. The Corps of Engineers Highway Methodology is an example of an agency's responsiveness (see Wetlands below).

Key regulatory issues for transportation projects involve the following areas:

- Wetlands;
- Waterways and waterbodies;
- Parklands;
- Historic and Archaeological Resources;
- Hazardous materials.

Two New England states (Connecticut and Massachusetts) also have analogs to the National Environmental Policy Act (NEPA), and Maine and Vermont have other statutes affording broad spectrum review of major projects. The critical subject of land use growth

patterns is treated separately at the conclusion of the chapter. Table 9.1 provides a matrix of key federal and state regulations.

■ 9.2 Methodology

The inventory involved a series of interviews with comparable officials in each state. Three types of officials were interviewed:

- State transportation officials responsible for project development and environmental clearances were interviewed for their perspective on the regulatory framework.
- State environmental officials responsible for the review of transportation projects were questioned about the issues raised by these projects and the manner in which the respective agencies approached the review process. There was also an interview with the Chief of the Corps of Engineers Regulatory Division.
- State planning officials were interviewed regarding the relationship between transportation system and growth patterns.

Standardized questionnaires were used to guide these interviews, which were conducted both in person and via telephone. Questionnaires are appended to this report.

■ 9.3 Wetlands and Waterways

Every transportation official interviewed named wetlands as the most common environmental issue to be addressed. In fact, because of the ubiquitous nature of statutory wetlands in New England, virtually every transportation project involving new alignments, widening of highways, and new or expanded port facilities or airports affects wetlands.

The Corps of Engineers has federal jurisdiction over wetlands through Section 404 of the Clean Water Act. The Section 404(b)(1) guidelines developed by EPA require the Corps to select the Least Environmentally Damaging Practicable Alternative (LEDPA). The Corps has developed a manual for wetlands delineation on a three-parameter model involving soils, hydrology, and vegetation. A good deal of the Section 404 review is carried out under nationwide or general permits applicable to smaller projects; however the regionally significant transportation projects that are the focus of NETI would in most instances require individual 404 permits.

The Corps process begins with determination (by the Corps) of the Purpose for the project, identification of the study area and all Practicable Alternatives, determination of the

impacts of the alternatives, leading to the LEDPA identification and determination of necessary mitigation. The process seeks first to avoid statutory wetlands, then to minimize impacts, and finally to mitigate for unavoidable impacts. The EPA reviews and may overturn a Corps determination (as occurred in the Attleboro Mall case in Massachusetts).

The Corps Highway methodology is noteworthy in that it encourages early involvement in the regulatory process by the state transportation agency, and it provides opportunities through a workshop approach for federal and state natural resource agencies and regional planning agencies to be involved in the early stages of study area delineation and identification of practicable alternatives. This type of coordinated early involvement is beneficial both for the minimization of environmental damage and for the development of transportation projects without undue delay. As noted below, the New England states also regulate activities that affect wetlands, and these state permitting agencies are in some cases reluctant to participate in the Corps workshops or to review projects until they are in more advanced stages of design. (In New England, only New Hampshire has been delegated Section 404 review authority by the Corps.)

Mitigation for wetlands impacts often takes the form of development of replacement wetlands. The Corps advocates a wetlands banking program wherein substantial wetlands would be established by state transportation agencies in advance of the projects that would claim portions of the banked acreage to satisfy project mitigation requirements. While this approach generally would not provide replacement wetlands close to the site receiving impacts, it has the advantage of sufficient scale to achieve wetland values, and by providing the replacement wetlands in advance of impacts, the success of the mitigation is more easily assured.

State wetlands protection programs operate under one or more statutes, which were generally enacted prior to effective federal regulatory programs. Thus the states often delineate wetlands in a manner that is methodologically different than the federal model, resulting in state delineations that may be more or less restrictive than the federal delineation depending on circumstances. Thus, state wetlands protection (except in New Hampshire) acts as a second layer of regulatory process with slightly different areas subject to review and a review process that is in general wholly distinct from the federal process in timing, procedure, and criteria. While wetlands regulations are also different from state to state, there were very few instances in which individual projects were reviewed by two states (as for example for a bridge over a stream forming the state boundary).

For most of the New England States, waterbodies and waterways are covered under the same regulations as wetlands.

Connecticut

In Connecticut, permitting occurs through the Department of Environmental Protection (DEP), which has responsibility for issuing the Inland Wetlands and Water Courses Permit (wetlands and waterways are protected under the same regulations). Because the state regulations do not match the federal regulations, there are some coordination problems. The Corps of Engineers 404 permit procedures require an examination of alternatives, while the state environmental documents are prepared for the Preferred Alternative only.

The timing is often a problem because if the state wetlands reviewers are not satisfied with the Preferred Alternative they can require additional alternatives to be examined. Those new alternatives are not necessarily consistent with the ones identified by the Corps. There is currently an attempt to streamline this process and to make it consistent with the Corps manual for integrating Corps Section 404 with the NEPA EIS Process, but as yet this has not been implemented.

Maine

Permitting for wetlands comes under the Maine DEP, Bureau of Land Quality Control, Division of Natural Resources. DEP feels that the state/federal wetlands review coordination works fairly well. The Corps of Engineers' programmatic General Permit for the state avoids duplication of review for smaller projects. DEP is currently examining the state/federal regulatory fit and will report back to the legislature in February 1995. The study will look at possible efficiencies the state can implement, including state assumption of the 404 program in Maine as New Hampshire has; (this is of some concern to DEP because of staffing/workload issues). A parallel study by the State Planning Office is looking at the statewide wetlands management strategy and is also being driven by the February 1995 deadline. Mitigation is a primary concern. The regulations now require looking for compensation in the same watershed or in the project vicinity, as close as possible to the impacted site. A major issue right now is how to deal with "mitigation banking," and a proposal for a New England-wide mitigation banking system is being developed by the Interstate Water Pollution Control Commission. A perceived problem is how to identify and prioritize regional sites and how to structure the mechanism for transferring credits. Federal/state policy inconsistencies make mitigation more difficult (e.g., the state might look at impoundment favorably because it enhances waterfowl habitat; the federal opinion might be less favorable because of the wetland alteration required).

Massachusetts

The Massachusetts Wetlands Protection Act dates back to 1974. It is unique in New England in vesting primary responsibility with local Conservation Commissions, although administrative appeal to Massachusetts DEP is virtually automatic for large transportation projects. Wetlands delineations are based primarily on vegetation, making state wetlands either more or less extensive than federal wetlands, depending on circumstances. A variance procedure is required for alteration of more than 5,000 square feet of vegetated wetland; this process is long and cumbersome, and of the relatively few variances that have been granted over the history of the program, most have been for MHD highway projects. The Chapter 91 Waterways program regulates structures, fill, and dredging in, on, and over streams and rivers, great ponds, the intertidal zone, and historically filled tidelands. The Chapter 91 regulations provide different performance standards and mitigation requirements for uses that are water-dependent (e.g., pier) and non-water dependent (e.g., hotel); bridges to carry transportation facilities across waterways are water dependent uses, but in complex situations, determinations must be made of each project component. Public access to the water is a major objective in mitigation under Chapter 91.

As in several other states, the Massachusetts DEP tends not to become involved in early stages of project development, preferring instead to wait for well developed design.

However, the Massachusetts Highway Department (MHD) does attempt to involve the Conservation Commissions early in the process, often through Requests for Determination of Applicability.

MHD feels that it has a good working relationship with the Corps of Engineers, and would prefer to see more DEP involvement in the Corps Highway Methodology. For large projects, MHD participates in agency task forces involving federal and some state resources agencies and regional planning agencies; this approach is seen as productive and efficient in avoiding or resolving environmental problems early in the development of projects.

New Hampshire

The New Hampshire Wetlands Board administers the state's wetlands program through the Water Resources Division of the Department of Environmental Services (NHDES). New Hampshire is unique in New England because of its Corps of Engineers' programmatic General Permit. This general permit program defers all "minimum" and "minor" and some "major" wetlands applications under Section 404 of the federal Clean Water Act to the State Wetlands Board, eliminating dual (state/federal) applications. Certification from the New Hampshire Department of Resources and Economic Development (DRED), Natural Heritage Resources Office, for rare and endangered species review is also required for the wetlands permit. The Significant Alteration of Terrain Permit, administered by NHDES, Water Supply and Pollution Control Division, is processed concurrently with the wetlands permit. The New Hampshire Rivers Management and Protection Program, parallel to the federal Wild & Scenic Rivers Program, provides advisory input to the Wetlands Board.

Rhode Island

The Rhode Island Department of Environmental Management (RIDEM) is responsible for the permitting of alterations to freshwater wetlands, while the Coastal Resources Management Council (CRMC) has jurisdiction over tidal wetlands. In brackish situations, jurisdiction is shared.

RIDEM's Division of Freshwater Wetlands administers that department's permitting program. State regulations define wetlands by vegetation type and hydrology, a different definition than that used by the Army Corps of Engineers. The wetland definition includes floodplains, watercourses and waterbodies and a statutory setback as well as biological wetlands. The regulations regarding freshwater wetlands are currently being revised (draft revisions were released for public review in December 1993). Wetlands permit applications must demonstrate that all potential impacts to freshwater wetlands have been avoided to the maximum extent possible, and that there are not less harmful alternatives. The written evaluation includes a determination of the impact to wetland functions and/or values. Because the Freshwater Wetlands permit tends to be the most critical permit, RIDOT has several staff members committed to preparing these permit applications.

The Coastal Resources Management Council has jurisdiction over all alterations or activities in tidal waters or within 200 feet of a coastal feature. Tidal wetland are coastal features and are identified by vegetation. Issuance of the CRMC permit is the last step in the state regulatory process.

Any project resulting in a discharge to the waters of the state also requires a Water Quality Certification, issued by the RIDEM Division of Water Resources. Thus, the Water Quality Certification is required prior to the issuance of a RIDEM Permit to Alter Freshwater Wetlands, a CRMC Assent or an ACOE 404 Permit.

Vermont

In Vermont, permits are required under separate regulations for Management of Lakes and Ponds (permit for fill), Stream Alteration, and under the Wetlands Rules of 1990 (conditional use permit). As in most other states, the permitting group within the Agency of Natural Resources (ANR) does not provide conceptual approvals early in the development of a transportation project, requiring well-developed design documents from VAOT before beginning the permit process; this can sometimes lead back toward "square one" if ANR sees the need for design modifications. This situation is due at least in part to the limited staffing levels and heavy work loads within the environmental agency. Requiring well-developed design is a means of making reviews more efficient but can reduce efficiency within the transportation agency if significant project modifications are necessary. A memorandum of Agreement between AOT and ANR provides for early notification of projects during the AOT scoping process for bridge rehabilitations and replacements, including an early site visit. Another MOU is currently being developed to increase coordination between these agencies.

■ 9.4 Historic/Archaeological Resources and Parklands

Two federal statutes protect cultural resources: Section 106 of the National Historic Preservation Act of 1966 as amended, and Section 4(f) of the Transportation Act of 1966. The latter statute is more stringent in requiring complete avoidance of the resource if any prudent and feasible alternative exists and further requiring minimization of harm if avoidance is not possible. Section 4(f) also applies to publicly owned parkland, recreation areas, and wildlife refuges. It is in some respects parallel to Section 404 in seeking first to avoid protected resources through the definition of alternatives, and then to minimize impact. It is administered by the Federal Highway Administration within the NEPA process but requires consultation and input from the State Historic Preservation Officer or park agency, and it gives substantial weight to this input.

Section 106 is coordinated by the transportation agency official in communication with the state historical commission. Per the regulations of the Advisory Council on Historic Preservation (36 CFR Part 800 "Protection of Historic Properties") all of the National Register listed or eligible resources in a project area are identified. In the case of an adverse effect, a Section 106 Preliminary Case Report and a Memorandum of Agreement is prepared documenting the measures that will be taken to minimize or mitigate impacts. In the case of adverse effect, a Memorandum of Agreement is prepared documenting the measures that will be taken to minimize or mitigate historic impacts. The U.S. Advisory Council on

Historic Preservation is also a signatory. In federally funded transportation projects, Section 106 review is also reflected in the Section 4(f) Evaluation, which has more stringent standards for avoidance.

These issues can create lengthy project delays and are highly significant from a quality of life and perceived quality of life perspective.

Connecticut

Connecticut has no regulations regarding parkland protection, although many projects would come under federal 4(f) and/or Land and Water Conservation Fund [Section 6(f)] protection. There is some coordination during project planning phases with the DEP Bureau of Outdoor Recreation. Impacts to historic resources are reviewed by the State Historical Commission.

Maine

In addition to providing SHPO review for the 4(f) and Section 106 processes, the Maine Historic Preservation Commission (MHPC) reviews non-federally funded transportation projects. This review, however, is unofficial and not mandated by any statute. Maine DOT's policy is to have MHPC review projects at the early planning stages, and for larger long-term projects, periodically over the course of the project. Historic preservation was one of the goals stated in the Growth Management Act. The state has no mandated review of projects for impacts to parks and recreation areas.

Massachusetts

In addition to reviewing all federally-funded projects as part of the Section 106 process, the Massachusetts Historical Commission reviews all state projects which are subject to MEPA review (see description below under Broad-Spectrum Environmental Review). MHD feels that it has a good working relationship with the Massachusetts Historical Commission, a relationship helped by MHD's having an in-house cultural resources staff.

Article 97 of the Massachusetts State Constitution states that any change of use or disposition of publicly owned lands under use for "the conservation, development and utilization of agricultural, mineral, forest, water and other natural resources of the Commonwealth" shall require approval of a two-thirds roll-call vote of the Massachusetts General Court. The land uses which have been held to come under the rule of Article 97 have evolved broadly to include such uses as parks, monuments, reservations, athletic fields, concert areas, playgrounds (including those situated on school property), cemeteries, and publicly-owned historic districts and sites. The legislative action required under Article 97 comes relatively late in the project development process, when right of way must be transferred to the transportation agency. In practice, the issues raised by the use of such lands are typically either dealt with successfully during the environmental review process under Section 4(f) or else the project never gets to the stage where Article 97 comes into play; if these earlier hurdles have been properly cleared, legislation prior to right of way acquisition is less likely to be a problem.

New Hampshire

The historic resources program in New Hampshire is a compliance program rather than a permit program. The program is comparable to the federal Section 106 process, but is used even when no federal funds are involved. NHDOT affords the SHPO review and comment opportunities. If significant resources are identified, NHDOT is likely to determine eligibility for the National Register. The Acquisition of Municipal Land Used for Recreation or Conservation Program has procedural requirements for projects involving acquisition of municipal recreation or conservation land; municipalities must be allowed to comment on the impacts, and public hearings require longer lead times (90 days) than normal public notice.

Rhode Island

The Rhode Island Historical Preservation Commission (RIHPC) reviews all federally-funded projects as part of the Section 106 review process. Per the Rhode Island Historic Preservation Act of 1968 and its implementing regulations, "Procedures for Registration and Protection of Historic Properties," the RIHPC also reviews and comments on all state-funded projects and municipal projects that are state funded and/or require approval from the State Planning Council.

Rhode Island has no state regulations specifically regarding parkland protection; however, recreational values and archaeological sites receive special consideration in the freshwater wetlands permitting process. Many projects would also come under federal 4(f) and/or Land and Water Conservation Fund protection.

Vermont

VAOT has recently added resource specialists in historic resources and archaeology to its planning staff to help improve in-house environmental review during project scoping and to assist in coordination with the SHPO, located in the Agency for Development and Community Affairs (ADCA). AOT is currently studying the many historic truss bridges in the state which will require repair or replacement and planning for appropriate treatment of historic bridge structures. In general, compromise satisfactory to both the Division of Historic Preservation and AOT appears generally to be possible to reach.

■ 9.5 Hazardous Materials

Two federal statutes and state analogues are becoming increasingly relevant to transportation projects. They are CERCLA, the "Superfund" law, which applies to contaminated sites, and RCRA, which applies to the production, and especially in this context, the transport and disposal of hazardous wastes. These statutes are complex and even a full explanation of their provisions is beyond the scope of this report. In general, projects which acquire and disturb sites on which any of a large list of chemicals may be present must properly identify contaminants, take steps to remediate this situation, protect

workers and the public during this process, and properly dispose of the hazardous waste or contaminated soil. Paint removal during bridge maintenance is another instance in which RCRA is applicable. Problems for transportation projects are potential delays, legal entanglements with third parties, and disposal costs, which are very high and increasing.

Connecticut

The Bureau of Hazardous Materials (within ConnDOT) regulates the disposal/disturbance of hazardous materials, but this is rarely an issue during environmental review of transportation projects. Evaluations of the potential for hazardous materials are more likely to take place later, as part of the acquisition process.

Maine

The Maine DEP, Bureau of Hazardous Materials and Solid Waste Control, Enforcement Division, administers the hazardous materials program. The rules are generally consistent with federal RCRA regulations and provide a comprehensive regulatory program for hazardous waste identification, handling, transportation, storage, treatment, disposal and recordkeeping. Generally, compliance with RCRA will achieve compliance with Maine hazardous waste management regulations. The primary concern for DOT projects is in regard to lead paint waste resulting from bridge maintenance.

Massachusetts

MDEP administers state analogues to RCRA and CERCLA, known as Section 21C and 21E, respectively. The state regulations differ from federal in that waste oil is treated as a hazardous material in Massachusetts, a fact of great importance to transportation projects because of the common occurrence of this material in contaminated sites that are, in turn, used for transportation projects. Massachusetts is gaining a great deal of experience with the hazardous materials issue, owing in part to the procedures developed for the Central Artery Project, which involves a great many sites that are affected by some degree of contamination. MHD and MDEP have worked closely together on this project and have developed effective protocols for the characterization and clearance of contaminated sites as well as the routine testing of excavated material from sites not known to be contaminated. This working relationship and experience is being applied to other projects such as the Route 146/Mass. Turnpike connection.

One aspect of site contamination facing projects such as roadways and rail lines is that the project right of way may include a small portion of a larger contaminated area (such as an industrial site). MHD and MDEP are working toward a memorandum of agreement on procedures for defining the limits of required remediation in such situations, based on a soil and groundwater management plan supported by data provided by the highway department.

New Hampshire

The New Hampshire Hazardous Waste Rules are administered under the DES, Waste Management Division. As related to transportation projects, this is largely a compliance rather than permit program, comparable to the federal RCRA program. New Hampshire's

program is more stringent than the federal program with regard to definition of small-quantity generators. For NHDOT projects involving lead paint waste, material is usually certified on-site by DES. DES is seeking a legal opinion from the New Hampshire Attorney General on whether treatment for contaminated soil is resource recovery and therefore can avoid the need for an Air Resources permit for a treatment facility.

Rhode Island

Rhode Island enforces federal RCRA/CERCLA regulations, but does not have its own regulations to deal with hazardous materials.

Vermont

Vermont has had little experience to date with site contamination that significantly affects transportation projects. One instance involved pesticide residues at a regional airport where a crop-spraying operation had been based. A current project involving rail yard improvements may pose a much greater level of complexity in dealing with materials covered by RCRA than VAOT has previously experienced.

■ 9.6 Noise

Noise from transportation projects is addressed primarily through the National Environmental Policy Act (NEPA) EIS process and through U.S. DOT policies regarding noise abatement. In practice, noise may be a contributing issue in decisions about transportation alternatives, such as highway alignment options, but it is usually one among several other proximity impacts associated with the alternative. It is also a factor which is weighed in the Section 106 process for historic properties and Section 4(f) for historic and parkland resources. For airports, noise is often the most important factor. In general, the approach to noise is not regulatory, but instead focuses on noise mitigation or abatement.

FHWA has established Noise Abatement Criteria (NAC) for different land uses, and will consider noise mitigation in the form of noise barriers if these noise levels are exceeded at sensitive receptors, and if noise barriers would be cost-effective in the specific situation. For residential and outdoor recreation facilities, the NAC is 67 dB, and cost-effectiveness is often interpreted as the achievement of a 10 dB reduction in noise levels as predicted by a computer model. FTA utilizes the FHWA methodology in situations where transit would cause noise impacts, as for example at residences adjacent to a rapid transit line.

The FAA participates in airport noise monitoring, analysis, abatement, and mitigation. Most major airports have noise monitoring programs, and based on analysis of noise patterns, a variety of operational procedures have been implemented to reduce noise or to direct it away from residential areas. The departure procedures on Logan's runway 22R, which involves a left turn over the harbor, is an example. FAA also participates in noise-proofing residential structures exposed to airport noise; such programs, which involve retrofitting windows and insulation to reduce interior noise levels, are currently underway

at Logan, Manchester and Green airports. The Federal Aviation Regulations (FAR) Part 150 addresses airport noise compatibility. Under this regulation, the FAA sponsors studies to analyze noise exposure and to develop noise compatibility plans. These plans may include a variety of noise abatement measures, noise-proofing, and land use mitigation to control the growth of noise sensitive uses within the areas of highest noise. Part 150 studies use a day-night weighted average noise level, or Ldn, to summarize the pattern of discrete noise events as airplanes depart and arrive in accordance with geographic traffic flows and established air traffic control procedures. The FAA Advisory Circular suggests that residential uses are generally incompatible with Ldn levels in excess of 65 dB; however, each Part 150 study may adopt its own threshold of compatibility, and 60 Ldn has been adopted in a number of these studies. Part 150 studies are in progress or recently completed at Pease and Manchester airports in New Hampshire.

■ 9.7 Broad-Spectrum State-Level Environmental Review

The National Environmental Policy Act (NEPA) is the fundamental environmental review statute, requiring analysis of transportation project alternatives in a publicly reviewed Environmental Impact Statement. Among the New England States, Connecticut and Massachusetts have analogs to NEPA which require environmental review under a range of categories. Generally, there are state actions and/or size thresholds that trigger review. These are process-oriented rather than permit-oriented regulations whose purpose is to provide orderly decision-making in the development and assessment of project alternatives.

Vermont's Act 200 is a permit-oriented statute that applies to transportation projects affecting more than 10 acres of land. In addition, Maine has a broad spectrum review from which most state projects are exempt, and a specific act oriented to planning review of transportation projects.

Connecticut

The Connecticut Environmental Policy Act review process deals only with actions by state agencies. The CEPA review process is administered through the Office of Policy and Management, rather than DEP. It is modeled after NEPA, with similar review periods. Joint NEPA/CEPA documents are filed for most projects. CEPA's Environmental Impact Evaluation is analogous to NEPA's Environmental Impact Statement or EA/FONSI. Coordination problems with federal regulatory agencies (e.g. Corps of Engineers) tend to be the result of permitting procedures, rather than overall environmental review. CEPA review precedes the permit process. If ConnDOT evaluates alternatives during the CEPA process, alternatives are not required at the permit stage. OPM is currently making an effort to include state permitting agencies early in the CEPA process so that alternatives to be evaluated are agreed upon by all parties early on.

Maine

This state's Site Location of Development Act is not a NEPA analog but a permit-oriented statute that affords broad review under a number of categories. State transportation projects, however, are exempt from its coverage. Maine Turnpike Authority projects are not exempt.

Maine recently passed a state referendum establishing the Maine Sensible Transportation Act, which provides for regionally-based citizen input into project planning, and a requirement to consider alternatives to facilities serving single passenger automobiles. The act is in its early stages of implementation.

Massachusetts

The Massachusetts Environmental Policy Act environmental review process (MEPA) applies to activities of all state agencies, activities with state agency funding, and activities which require permits granted by state agencies. The two-tier process is very similar to the NEPA process, with an Environmental Notification Form discussion of potential impacts forming the basis for a decision on the necessity for and/or scope of the Environmental Impact Review document. Project alternatives are discussed in the Draft EIR, with a Preferred Alternative designated in the Final EIR. In virtually all cases, there is a single joint process leading to a combined state/federal document. However, state action is mandated through the MEPA Certificate of the EOEA Secretary, which may include mitigation requirements not recognized by the participating federal transportation agency.

New Hampshire

New Hampshire has no NEPA analog. The New Hampshire Council on Resources and Development (CORD) is a gubernatorial council consisting of the directors or commissioners of major state departments (e.g., DOT, DES, Office of State Planning, etc.) that functions as an independent review body for major development projects. The intention is to have CORD present a coherent articulation of state policy or decision on large projects. The current chair is the head of OSP.

Rhode Island

There is no state NEPA analog. The Rhode Island Department of Environmental Management (RIDEM) Office of Environmental Coordination solicits input from RIDEM Divisions and gives comments on NEPA documents to RIDOT prior to the permitting process. Environmental impacts are further evaluated as part of the permit process. Environmental plan submission for permitting is designed to get local permitting authorities in line prior to or concurrent with the NEPA Record of Decision, helping to assure that permits can be issued for the same alternative approved through the NEPA process.

Vermont

Act 250 is one of the oldest state environmental and development review laws in the nation. It is administered by regional District Environmental Commissions (with appeal to a State Environmental Board). As alteration of 10 acres of land is one of the Act's

thresholds, many transportation projects are covered. The Act has ten performance criteria covering, for example, soil erosion, as well as conformity to local and regional plans. While the performance standards are clearly foreseeable and are generally met by first securing applicable permits under other state regulations, a less desirable aspect of Act 250 is that its process begins only after all other permits are in hand. In the case of a controversial project, there is risk of denial or significant modifications late in the project development process.

The Act is subject to legislation review this year. At present, anyone can become a party in a permit case at any point in the proceedings. Proposed amendments would limit party-status input to the beginning of the process.

■ 9.8 Land Use and Growth Patterns

Land use and transportation infrastructure are part of a dynamic cycle of growth. Transportation is a key factor in accessibility and therefore, in land value, influencing growth patterns strongly but not solely. (There is evidence that other types of infrastructure such as water supply and sewerage may be stronger stimulants to growth patterns.) Land use patterns, in turn, generate specific demands for the transportation system, including differing demands by mode.

Perhaps the chief aspect of the land use-transportation relationship is the mutually stimulative effect of low density development patterns and single passenger automobile use. Over the past four decades, in all parts of the United States, suburban residential development has occurred at low densities at progressively greater distances from center cities. Over nearly as long a period, places of employment including retailing and offices have developed along the circumferential highways at the periphery of the urban areas. In addition to these growth trends, social and economic change has more recently led to many more households with two wage earners. The combined result of these growth patterns and other changes is a highly dispersed travel pattern, where commuting is much less heavily concentrated on downtown areas, and non-commuting trips are also highly dispersed. This has led inevitably to increased vehicle miles travelled, adding to roadway congestion and partially offsetting gains in air quality due to cleaner vehicles. At the same time, and for the same reasons, there has been a decline in multi-passenger modes of transportation.

The preceding paragraphs apply generally to all New England states, although the changes in the rural portions of New England have been subtly different. The general phenomenon, known as "sprawl" is due to market forces unconstrained by development regulations and reinforced by our system of municipal finance (which encourages competition for certain kinds of development so that land uses can be taxed).

Opinions differ on the costs, benefits, and causes of dispersed growth patterns. Development interests and land owners see these growth trends as the inevitable result of

the market, and these interests resist distortions in the market and interference with property rights. On the other side, various persons and groups regret the changes in character that result from highway strip development and the loss of downtown retailing to malls and "big-box" discount stores located at nodes in the transportation network, where they can serve the largest market areas. In addition, dispersed development is criticized because it may affect more sensitive areas such as wetlands.

The most clear-cut conclusion about the link between transportation and land use is that current land use patterns make it difficult to control the growth in vehicle miles travelled, with consequent air quality impacts and difficulties for State Implementation Plans; (see the section on Air Quality). These commuting patterns are potentially of regional significance if they cross state lines (e.g., with many work trips to the Boston metropolitan area originating in New Hampshire and Rhode Island) as well as the common interest of the states in meeting the Clear Air Act standards.

On the positive side, there are occasional opportunities to stimulate development of appropriate sites by investing in the transportation infrastructure, as for example on industrial land next to an intermodal transportation facility.

The responses to the problem of mediating the relationship between land use and transportation can be generally summarized as seeking ways to encourage more concentration in new growth, coupled with the realization that, especially in New England, most of the development that will occur is already in place, and it will be a very slow process to change density patterns enough to have a measurable effect on travel patterns. Nonetheless, many proponents of this "interventionist" viewpoint believe that any improvement is worthwhile if some sensitive areas are left undeveloped and some transit service or carpooling is made possible by a few pockets of serviceable density, with seven dwelling units per acre sometimes cited as a minimum for transit service. (One example that has been fully worked out at a regional level is "A New Approach Integrating Transportation and Development in the Capital Region" by the Washington Regional Network for Livable Communities, 1993.)

In New England, there has been considerable effort by private organizations like Maine Tomorrow and 1000 Friends of Massachusetts. A Governors' Commissions grappled with this problem in Vermont in 1988. Connecticut maintains a five-year state land use plan called the Policies Plan for Connecticut, and Rhode Island completed a state land use plan in 1989. But overall, there has been very little state-level analysis of growth patterns and land use, (at least little that is intermediate between raw Geographic Information Systems databases on the one hand and very broad-brush qualitative descriptions on the other). The reason for this is undoubtedly due to the qualitative similarity of the growth patterns throughout each state (allowing for metropolitan/rural distinctions) and the difficulty of bringing policy to bear on these patterns. In other words, land use is mostly controlled at the local level.

The following summarizes activity in state-level land use planning and growth analysis.

Connecticut

The Office of Policy and Management produces a Conservation and Development Policies Plan every five years. The most recent one is for the 1992-1997 time period. The state is in the process of developing a GIS system (ARC INFO) for preparing this plan. A GIS system would allow the state to incorporate the more fine-grained land use information currently maintained at the regional and local levels. There are no economic growth projections, although growth areas are expected to be fairly consistent with the map shown in the Conservation and Development Policies Plan. Major growth areas are primarily around existing highway corridors and include the I-95 corridor along the coast, the I-84 corridor, Fairfield County and possibly along Route 7. The other major growth area, not related to transportation infrastructure, is the Ledyard area which is expected to have significant economic development as a result of its recently developed casino. The casino is expected to be a major economic development catalyst for the next 20 years. Commuter lots are being expanded to provide off-site parking for casino employees, helping to relieve some of the traffic congestion in the adjacent towns.

Maine

Growth patterns have been highly dispersed, with a great deal of residential development on existing road frontage and strip commercial development along highway corridors. Growth has focused in southern coastal areas, due in part to in-state migration from economically less active inland regions. The Growth Management Act of 1988 was in part a reaction to movements for local planning moratoriums in towns whose growth rates had accelerated during the real estate boom years. The Act provides for the development of local comprehensive planning, beginning with the towns with highest growth rates. When a local plan is consistent with the Act, the Maine Office of Business Development tries to coordinate state agencies on behalf of related projects that support the plan.

The Study Committee on Land Use Regulatory Reform is looking at the land use/transportation relationship. Maine DOT is preparing an access management handbook and forming Regional Transportation Advisory Committees as part of the Sensible Transportation Policy Act mandate, placing Maine on the cutting edge of coordinating land use and transportation planning at the local, regional and state levels. There are also regional transportation programs associated with the regional councils.

In March 1993, the Maine Alliance Foundation, a Maine business lobby, produced "Working and Living with the Land," which supported and recommended a reform of Maine's land use management system to better promote environmental protection, positive economic development, and healthy communities. There is a proposal to establish a Maine Growth Commission in the Governor's Office.

Transportation projects with a noticeable impact on growth patterns include interstate highways and port development. Interstates have increased the potential for industrial development in some rural areas and enhanced the efficiency of natural resource industries. Interstates have had an especially significant effect in York and Cumberland Counties, and improved access to Sebago Lake and the Lakes Region has hastened economic development of that region. The biggest impact on growth patterns from transportation projects is I-95 and the Maine Turnpike. The Economic Corridor Action

Grant Program was a former grant program targeting economic development in transportation corridors defined by Maine DOT. Bangor International Airport, combining I-95 access, a rail spur from the Searsport cargo port and its status as the closest American airport to Europe, is an example of a transportation project with an economic development focus.

Massachusetts

Most effort in analyzing growth patterns and attempting to integrate land use and transportation planning is occurring at the regional level. The Boston area regional planning organization, MAPC, for example, has 101 member cities and towns. Its 1993 MetroPlan 2000 includes a concept called Concentrated Development Centers (CDC), which may be designated based on a number of criteria, including relationship to public transportation and contribution to reduction in auto-dependent travel. These CDCs, which may include existing downtown areas, are nominated by member communities, and if appropriate, approved by the Council and placed on the regional development map, earmarking them for priority in public infrastructure investment. MAPC has also worked with the Massachusetts Executive Office of Transportation to develop a procedure for the metropolitan Transportation Plan that is more responsive to regional planning considerations, presumably including designated CDCs.

Planning is currently underway in Massachusetts to develop a major intermodal rail facility at Fort Devens, an Army base slated to be closed, which also has a substantial amount of associated land potentially usable for development benefiting from this facility.

New Hampshire

Land use growth has focused in recent times in the state's southern counties along major highway corridors, historically along rivers and railroads. The I-93 and I-95 corridors have had noticeable growth in recent years. Corridors in the state are important for both access to workplaces and access to natural resources/recreation areas due to year-round tourism. Growth pressure from tourism and seasonal home development are most prevalent in the northern part of the state. In the southern part, pressure has been more from industrial and business development.

The state's 1992 State Development Plan contains some discussion of transportation as it relates to economic development, but there has been little work on the relationship between land use and transportation. ISTEA is improving this coordination and OSP is now coordinating with NHDOT on land use planning. OSP is now doing land use and resource inventory work on a detailed planning project with a transportation modeling component as well as land use, zoning, and an analysis of alternative corridors. The state is looking more at land use issues on a broader, regional, corridor-wide basis.

New Hampshire is currently conducting a Statewide Mass Transportation and Air Quality Projects Planning Study. Mobility in the northern part of the state needs attention as a competitiveness issues. There has been discussion of improving the network of small airports in that area.

State and federal regulations have a greater influence on transportation project development than planning. New Hampshire transportation project planning is unique and involves significant public input in the planning stages. The Governor's Advisory Commission on Highways conducts hearing around the state to get 10-year plan ideas, revised every couple of years. The Commission also must approve project alternatives prior to selection of Preferred Alternative.

Rhode Island

A state land use plan was prepared in 1989 and is still relatively accurate. The state land use plan tries to encourage more compact growth. It points out the past trend of decentralization of development. Prime areas for growth have included the southern part of the state, the northwest corner, and the southwestern coastal area (West Bay, Aquidneck Island). The eastern portion of the state and central cities have seen less growth. Because of the state's small size, there is no regional planning. The Division of Planning of the Department of Administration is the Metropolitan Planning Organization for the entire state. Each municipality is required to prepare a Community Comprehensive Plan in accordance with the state guidelines. When the Community Comprehensive Plan has been approved by the state, it is binding upon the community and the state. Thus, state transportation projects must be in conformance with the municipality's plan. Local zoning ordinances are the major controls on how undeveloped land will be ultimately used. The 1989 Land Use Plan states that 95 percent of all land under local jurisdiction is zoned for development. The Plan contains a Year 2010 land use map with undeveloped land (approximately two-thirds of the state's land area) allocated to four development categories: area of high intensity development potential, area of moderate intensity development potential, area of low intensity development potential, and area of positive conservation potential.

There have been some recent transportation projects directly linked to economic development goals. The chief among these is the development of the Quonset/Davisville Industrial Park, involving land exsessed in the past and about to be exsessed by the U.S. Navy. This site is large and has port facilities and an airfield; RIDOT is working to provide a rail freight connection from the Northeast Corridor and new highway connections to Route I-95. Others include the Route 99/Woonsocket Industrial Highway to Route 146, which serves a new industrial park, and the East Providence Industrial Highway (Waterfront Road). The upgrading of U.S. 6 in western Rhode Island is viewed as an important needed regional connection between the metropolitan Providence area and Hartford, Connecticut. In general, however, the existence of water and sewer service are viewed as greater factors in development planning.

Vermont

Land use and transportation are linked in Vermont regulations through the Vermont land use planning law, Act 200, requiring conformity of projects (including, presumably, state transportation projects) with regional and local comprehensive plans. VAOT has also taken the step of partially decentralizing its transportation planning process to the Regional Planning Commissions, providing a closer fit between transportation planning and regional plans. This is a \$1.6 million Planning Initiative.

■ 9.9 Aesthetics and Quality of Life

Transportation infrastructure is a major element in our everyday experience. It affects our quality of life directly by providing access through its introduction of major fixed structures and moving vehicles into our personal environments. Transportation also affects the environment through its connection with land use and development patterns, as previously described.

A number of commentators on transportation and the environment have suggested that as the New England economy evolves and attitudes and values regarding the environment change transportation policies should likewise change. While the movements of goods will always be necessary to our economy, an increasing share of economic activity is concerned with processing information and providing services. These changes are in addition to the growing importance of tourism, which is an economic sector strongly oriented to the quality of the environment, including not only mountains and beaches, but also the human environment of rural towns, city centers, and historic places. Transportation can affect the quality of life both for better and for worse.

Since the time of the first European settlers, the relationship of the New Englanders and their economy to the environment has changed. Natural features such as harbors and rivers were long treated as part of the transportation system, and land was the first economic base of the economy. As manufacturing developed and the region's economy became more highly integrated and linked to the nation's, the infrastructure of canals, railroads and roads became more important. Waterways became a means for waste disposal, and cities turned their backs to their waterfronts. The highway system eventually surpassed the importance of railroads in the period from 1950 through 1980. Today, although vehicle miles traveled continue to increase as two-worker household make the trip to work and New Englanders travel through the region for leisure activity, new highway alignments or major widenings are becoming more rare because of new attitudes toward the environmental framework of environmental regulations. The referendum vote against widening of the Maine Turnpike is a dramatic example of this new viewpoint.

Many new information-intensive businesses start up in New England both because of our many colleges, universities, and teaching hospitals in which entrepreneurs were trained, and also because of the high quality of life in New England which helps induce them to stay. An increasing number of observers and participants in transportation policy feel that tomorrow's policies must address these changes in the economic base of New England. This means addressing aesthetic issues in transportation decisions and increasing emphasis on aspects of transportation that improve the New England quality of life, such as transit, scenic highways, and renovation of historic transportation structures.

Aesthetics and visual analysis are among the factors now commonly analyzed in Environmental Impact Statements for transportation projects. Computer-aided design makes it possible to create perspective views from the road and views of the road from realistic human vantage points, as opposed to aerial and plan/profile views. Where highways pass through town centers, urban design and landscape analysis can provide

important information on how the sense of place and streetscape will be changed by reconstruction and improvement projects, and these analyses can lead to important design refinements and mitigation measures to avoid or minimize changes to the unique New England environments at the centers of our towns and cities. Improved billboard and signage controls positively affect the character of rural highways; Vermont was a pioneer in establishing uniform and well-designed informational signage along interstate highways. The ISTEA funding categories for enhancements and scenic highways can provide funding for improvement in the aesthetic environment of some of New England's outstanding landscape.

Transit programs, both urban and rural, provide an alternative to the cycle of increasing congestion and roadway capacity improvements. In urban areas, transit can directly improve the human environment by reducing congestion and improving access. As discussed in the section on Land Use and Transportation, the success of transit depends in part on sufficient density of land use to make service practicable, and this compact type of development pattern has environmental benefits in its own right by reducing sprawl and fostering pedestrian-oriented urban environments. Intercity rail and bus service can serve tourist and leisure trips and provide an alternative to energy intensive highway use. Rural transit helps to conserve the authentic sense of place of New England settlements and also provides an important social benefit to residents who are without access to private automobile. The preservation of bus and rail terminals, many of them historic structures, supports both the transit infrastructure and improves the quality of urban life through renovation of key centers of activity; there is an ISTEA funding category for these improvements.

In summary, as New Englanders become more concerned with both the natural and built environments, and as quality of life and New England's unique sense of place become more important in the economy of the 21st century, transportation policy must also evolve to avoid harm and provide support to the values which underlie these important assets.

List of Sources

■ Interviews

Connecticut

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Other

Bill Lawless (11/10)

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■ Questions

Land Use and Transportation for Land Use Officials

1. What studies or data (state level and/or regional level) are available on growth patterns over the past two decades?
2. Are there any growth projections for the next two decades?
3. How would you describe the amount and pattern of growth in the state? How would you characterize opinion within the state about the amount and pattern of growth?
4. Has there been any work done in the state or area on the relationship between land use and transportation?
5. Is there currently any coordination between land use and transportation planning, at the local, regional, and state level?
6. Are there transportation projects that have had a noticeable impact on growth patterns? What have been the benefits of this growth? Impacts?
7. Are there transportation facilities or nodes (like rail junctions or highway interchanges) where growth of industrial, commercial, or other types of land use are viewed as beneficial and to be encouraged?
8. In general, does the state's transportation infrastructure stimulate or retard growth compared to other New England states?



Environmental Regulation of Transportation Projects for Environmental Officials

1. What are the major state environmental laws that apply to transportation projects?
2. How does the state regulatory process for transportation projects mesh with the federal regulatory processes? What are the benefits, problems, inconsistencies, overlaps?
3. What are the major environmental issues of concern with transportation projects?
4. Are there any particular difficulties/problems with carrying out the state's environmental review process for transportation projects?
5. Do transportation projects have positive effects? If so, is there an example?
6. How much contact has there been or is there between neighboring states of review of transportation projects? Is more communication needed?

Environmental Regulation of Transportation Projects for Transportation Officials

1. What are the major state regulations that apply to state transportation projects? Is there a threshold for application of these state regulations?
2. Do these regulations have a significant impact on the planning and development of transportation projects (i.e., what projects are proposed, what projects are examined, what projects are implemented, etc...)? Which regulations have the greatest effect?
3. What are the major federal regulations that apply to state transportation projects? Is there a threshold for application of these federal regulations (e.g., NEPA)?
4. Do these regulations have a significant impact on the planning and development of transportation projects? Which regulations have the greatest effect?
5. How are the major federal regulations the same as or different from state regulations? Is there a state level of review of transportation projects that is parallel to NEPA? What are the differences in applicability or outcome?
6. Are there issues that arise out of the application of both federal and state regulations to individual projects (e.g., inconsistencies in requirements or definitions, timing problems, coordination between agencies)?
7. How do land use factors affect transportation planning and project development?
8. Does the state's transportation infrastructure stimulate or retard growth compared to other New England states?

Tables

Table 9.1 Matrix of Selected Federal and State Regulations

State	Federal	Connecticut	Massachusetts	Maine	New Hampshire	Rhode Island	Vermont
Env. Overview	NEPA FHWA/ FRA/FTA	CEPA	MEPA	Site Location of Development Act; Sensible Transp. Act.	None	None	Act 250
Wetlands	Corps 404	DEP: Inland Wetland and Watercourses Act	DEP: Wetlands Protection Act Ch 131-40	DEP: Maine Natural Resources Protection Act	DES: NH Fill and Dredge in Wetlands Act	RIDEM: Fresh Water Wetlands Act	Wetland Rules 1990;
Waterways	Corps 404, 401, 10	Same as above	DEP: Chapter 91	Same as above	Same as above	Same as above	Stream Alt. Pmt.; Mgmt. of Lakes and Ponds
Parkland	Federal DOT Agency: 4(f)	[park agency]	[park agency]	[park agency]	[park agency]	[park agency]	[park agency]
Cultural	Federal DOT Agency: 4(f)/106	[CT Historical Commission]	[Mass. Historical Commission]	[ME Historic Preservation Commission]	[NH Historical Commission]	[RI Historic Commission]	[Agency of Development and Comm. Affairs, Div. of Historic Preservation]
Hazardous	RCRA/ CERCLA	[DEP: Bureau of Hazardous Materials]	DEP: Chap 21E/21C	DEP: Maine Hazardous Waste, Septage, and Solid Waste Management Act	DES: New Hampshire Hazardous Waste Management Act	[RIDEM]	[Agency of Natural Resources]

[] Indicates state participation in federal process.

Appendix

State Aviation Organization Survey

DRAFT

New England Transportation Initiative State Aviation Organization Survey

State: Connecticut

Organization: Connecticut Department of Transportation, Bureau of Policy and Planning

Contact: Jon Kores

Phone: 203-594-2136

Fax:

1. Growth Trends

*For each of the listed aviation services, please check the box which most closely matches the expected trend over the next decade within your State. Please use **N/A** to indicate services which are not applicable to your State:*

	Growth	Stability	Decline	Unsure
Recreational/training general aviation		✓		
Business/executive general aviation	✓			
Scheduled commuter/regional service		✓		
Scheduled air carrier/national service		✓		
Scheduled international service		✓		
Charter	✓			
Freight	✓			

Comments:

D R A F T

**New England Transportation Initiative
State Aviation Organization Survey**

State: Connecticut

2. Regional Cooperation Needs

Do you feel there is a need for the six individual states in New England to increase their level of cooperation on aviation issues? If yes, please indicate specific areas where you see the highest priority for cooperation:

Coordination of capital projects within the AIP. FAA currently treats each State's Capital Improvement Plan as separate from other States'. We in Connecticut don't know what other States are spending or what their programs are.

Do you feel there is a need for airport sponsors in New England to increase their level of cooperation with each other? With the State aviation organizations? If yes, please indicate specific areas where you see the highest priority for cooperation:

AIP coordination at the State level for individual airports is needed, as well as coordination between States at the regional level.

DRAFT

New England Transportation Initiative State Aviation Organization Survey

State: Connecticut

3. Intra-regional Air Transportation Services

Do you feel there is a demand for increased air transportation services between city pairs within New England? Please list the cities in your State which you believe could support air service to destinations in New England other than Boston.

Connecticut airports now serve all destinations for which there is a demonstrated demand.

What trends do you expect over the next decade in the commuter airline market in New England?

The commuter traffic seems to be stable or growing for the business traveler.

DRAFT

New England Transportation Initiative State Aviation Organization Survey

State: Connecticut

4. Infrastructure Investment Needs

Please list the most important programs currently ongoing or planned by your office in the following areas:

Airport/capacity improvements
Priority 1

Ground access to airports
Priority 4

Nav aids/airspace
Priority 5 [tie]

Environmental protection
Priority 2

Legislation
Priority 5 [tie]

Financing
Priority 3

Other

In which areas do you see the greatest need for improvements in the air transportation system in your State?

DRAFT

New England Transportation Initiative State Aviation Organization Survey

State: Connecticut

5. Intermodal Transportation

For the transportation modes listed below, please indicate at which airports you believe new or expanded ground access services using that mode would be feasible. Please check as many boxes as appropriate:

[illegible]

DRAFT

New England Transportation Initiative State Aviation Organization Survey

State: Maine
Organization: Maine DOT, Air Transportation Division

Contact: Ron Roy
Phone: 207-287-3185
Fax: 207-287-2805

1. Growth Trends

*For each of the listed aviation services, please check the box which most closely matches the expected trend over the next decade within your State. Please use **N/A** to indicate services which are not applicable to your State:*

	Growth	Stability	Decline	Unsure
Recreational/training general aviation		✓		
Business/executive general aviation		✓		
Scheduled commuter/regional service	✓			
Scheduled air carrier/national service	✓			
Scheduled international service		✓		
Charter		✓		
Freight	✓			

Comments: Growth will take place at Portland and Bangor. At all other airports we feel that we are at the bottom of a downward cycle, have stabilized. We will see some slow growth for business/executive general aviation and charter in various regions of the State, e.g. Augusta, Bar Harbor, Rockland, Presque Isle, and Sanford.

D R A F T

**New England Transportation Initiative
State Aviation Organization Survey**

State: Maine

2. Regional Cooperation Needs

Do you feel there is a need for the six individual states in New England to increase their level of cooperation on aviation issues? If yes, please indicate specific areas where you see the highest priority for cooperation:

Yes. We need to ensure regional access to Logan yet we realize that capacity is an issue.

Do you feel there is a need for airport sponsors in New England to increase their level of cooperation with each other? With the State aviation organizations? If yes, please indicate specific areas where you see the highest priority for cooperation:

I see no reason for cooperation among sponsors. The states must sort out the transportation function of dealing with airports, capacity, and the movement of people and goods.

DRAFT

New England Transportation Initiative State Aviation Organization Survey

State: Maine

3. Intra-regional Air Transportation Services

Do you feel there is a demand for increased air transportation services between city pairs within New England? Please list the cities in your State which you believe could support air service to destinations in New England other than Boston.

Portland and Bangor. I don't see an increase in demand for destinations other than Boston. Trying to shift demand to other locations such as Bradley does not offer an alternative solution, nor does it provide the need of flexibility of access into the national system.

What trends do you expect over the next decade in the commuter airline market in New England?

Size of aircraft will increase. Frequency should decrease slightly. Demand will remain to access Logan.

DRAFT

New England Transportation Initiative State Aviation Organization Survey

State: Maine

4. Infrastructure Investment Needs

Please list the most important programs currently ongoing or planned by your office in the following areas:

Airport/capacity improvements

Continued airport development in support of economic development.

Ground access to airports

Improved access to interstate highway system at Portland.

Nav aids/airspace

En route radar facility for northern Maine.
Precision approach for Rockland.

Environmental protection

Legislation

Monitor future of Essential Air Service.
Airport Improvement Program reauthorization for three year period.

Financing

Other

In which areas do you see the greatest need for improvements in the air transportation system in your State?

We need to fully develop airports in eastern Maine and in the western mountain area to meet economic development needs. Unfortunately we become stymied as we look for the supporting navigation aids, especially ILS/GPS and AWOS/ASOS.

DRAFT

New England Transportation Initiative State Aviation Organization Survey

State: Maine

5. Intermodal Transportation

For the transportation modes listed below, please indicate at which airports you believe new or expanded ground access services using that mode would be feasible. Please check as many boxes as appropriate:

Airport	Interstate Rail	Commuter Rail/Subway	Ship/Ferry/ Hovercraft	Bus/Van	Bicycle	Pedestrian
Portland				✓	✓	✓
Bangor				✓	✓	✓

DRAFT

New England Transportation Initiative State Aviation Organization Survey

State: New Hampshire
Organization: New Hampshire DOT, Division of Aeronautics

Contact: Ron Wanner
Phone: 603-271-2551
Fax: 603-271-1689

1. Growth Trends

*For each of the listed aviation services, please check the box which most closely matches the expected trend over the next decade within your State. Please use **N/A** to indicate services which are not applicable to your State:*

	Growth	Stability	Decline	Unsure
Recreational/training general aviation		2	1	1
Business/executive general aviation	2		1	1
Scheduled commuter/regional service	1	2		1
Scheduled air carrier/national service	2	1		1
Scheduled international service	1			3
Charter		1	1	2
Freight	1	1		2

Comments: [Question no. 1 was reviewed by four Division of Aeronautics staff members. The number in each block reflects the number of staff members selecting that response. Other remarks in the survey response reflect opinions of individual staff members.]

Recreational and business-related general aviation flights will continue to decline as costs grow and fleet size shrinks. Regional and area scheduled services will be flat, at best. Many areas will continue to receive no scheduled service, or have a high turnover of their serving carriers. International flights using Pease may be a big factor for the State in the long term. Charter will continue to decline.

DRAFT

New England Transportation Initiative State Aviation Organization Survey

State: New Hampshire

2. Regional Cooperation Needs

Do you feel there is a need for the six individual states in New England to increase their level of cooperation on aviation issues? If yes, please indicate specific areas where you see the highest priority for cooperation:

Yes, physical size (i.e., area) of New England lends itself to cooperation. Airports (especially larger ones) have significant impacts outside the State boundary. Also, if certain airports can be identified by the states as particularly significant, this could encourage faster development for those airports. Example: Select ten airports for GPS approaches and concentrate FAA resources on those ten.

Do you feel there is a need for airport sponsors in New England to increase their level of cooperation with each other? With the State aviation organizations? If yes, please indicate specific areas where you see the highest priority for cooperation:

Yes, a regional airport sponsor's meeting would help share ideas for promoting the industry, maintaining good relations with the community, accommodating general aviation, airfield security, dealing with grant cash-flow problems, dealing with changes in air carrier service, dealing with high growth rates and demand for facilities, and other topics of interest.

DRAFT

New England Transportation Initiative State Aviation Organization Survey

State: New Hampshire

3. Intra-regional Air Transportation Services

Do you feel there is a demand for increased air transportation services between city pairs within New England? Please list the cities in your State which you believe could support air service to destinations in New England other than Boston.

No, the demand does not exist.

What trends do you expect over the next decade in the commuter airline market in New England?

Stability.

[Comments by second staff member:] I think the period will be marked by great turmoil as small operators fight it out. Although stability should be the goal of the industry, it's too competitive to be stable in the future.

DRAFT

New England Transportation Initiative State Aviation Organization Survey

State: New Hampshire

4. Infrastructure Investment Needs

Please list the most important programs currently ongoing or planned by your office in the following areas:

Airport/capacity improvements

Support for privately-owned airports. Tree cutting (i.e., obstruction clearing) projects.

Ground access to airports

Manchester Airport Access Road.

Nav aids/airspace

Protection of airspace by controlling towers, antennas, and wires.

Environmental protection

Legislation

Establishing licensing standards for airports.

Financing

Other

In which areas do you see the greatest need for improvements in the air transportation system in your State?

Preservation of existing facilities from encroachment by development and degradation of useable space caused by tree growth. In other words, support and appreciation from the airports' communities.

DRAFT

New England Transportation Initiative State Aviation Organization Survey

State: New Hampshire

5. Intermodal Transportation

For the transportation modes listed below, please indicate at which airports you believe new or expanded ground access services using that mode would be feasible. Please check as many boxes as appropriate:

Airport	Interstate Rail	Commuter Rail/Subway	Ship/Ferry/ Hovercraft	Bus/Van	Bicycle	Pedestrian
Manchester				✓		
Pease	✓		✓	✓		
Keene				✓		

DRAFT

A.3 Edited Survey Responses – Airports

New England Transportation Initiative Airport Survey

Airport: Bangor International Airport
Sponsor: City of Bangor

Contact: Bob Ziegelaar
Phone: 207-947-0384
Fax: 207-945-5998

1a. Historical Aviation Activity

*Please indicate the share (percentage) of enplanements at your airport which represent **connecting** passengers:*

N/M

*Please indicate the share (percentage) of enplanements at your airport which represent **international** passengers:*

5%*

* Direct international and connecting international (via Logan, Newark, JFK, and Atlanta)

DRAFT

New England Transportation Initiative Airport Survey

Airport: Bangor International Airport

1b. Historical Aviation Activity

The following tables list the historical aviation activity at your airport based on FAA statistics presented in the annual Terminal Area Forecasts and Air Traffic Activity reports. For cells indicated "missing", please provide the actual or estimated level of activity. If you collect your own aviation activity statistics and these differ significantly from the FAA values listed below, please provide us with your values. Please note that these aviation statistics are reported in Federal Fiscal Years (October 1 through September 30).

Annual Enplanements	FY 1991	FY 1992	FY 1993
Air Carrier	1,061,000	missing	missing
	1,040,032	958,884	808,847
Air Taxi and Commuter	88,000	missing	missing
	84,233	97,495	97,421
Total	1,149,000	missing	missing
	1,124,265	1,056,379	906,268

Annual Operations	FY 1991	FY 1992	FY 1993
Air Carrier	14,000	13,215	missing
	14,405	12,383	11,080
Air Taxi and Commuter	22,000	20,311	missing
	21,330	21,026	24,074
General Aviation & Military	88,000	79,429	missing
	82,702	78,956	79,450
Total	125,000	112,955	missing
	118,437	112,365	114,604

DRAFT

New England Transportation Initiative Airport Survey

Airport: Bangor International Airport

2. Growth Trends

*For each of the listed aviation services, please check the box which most closely matches the expected trend at your airport over the next decade. Please use **N/A** to indicate services which are not applicable to your airport.*

	Growth	Stability	Decline	Unsure
Recreational/training general aviation		✓		
Business/executive general aviation	✓			
Scheduled commuter/regional service	✓			
Scheduled air carrier/national service	✓			
Scheduled international service				✓
Connecting enplanements				✓
Charter		✓		
Freight	✓			

Comments:

D R A F T

**New England Transportation Initiative
Airport Survey**

Airport: Bangor International Airport

3. Regional Cooperation Needs

Do you feel there is a need for the individual airports in New England to increase their level of cooperation on aviation issues? If yes, please indicate specific areas where you see the highest priority for cooperation:

No. Aviation in New England appears to be a competitive industry that is embroiled in the politics of local interests. Given the current political and economic realities, I can't see that changing.

Do you feel there is a need for State aviation organizations in New England to increase their level of cooperation with each other? With individual airports? If yes, please indicate specific areas where you see the highest priority for cooperation:

Yes. There could be an attempt made to arrive at a common infrastructure investment strategy. In light of the above, however, I don't see much hope for success.

D R A F T

**New England Transportation Initiative
Airport Survey**

Airport: Bangor International Airport

4. Intra-regional Air Transportation Services

Do you feel there is a demand for increased air transportation services between your airport and city pairs within New England? Please list the cities in New England to which you believe air service could be supported (other than Boston):

Perhaps Manchester, if that city can establish long-range services (in competition with Boston).

What trends do you expect over the next decade in the commuter airline market in New England?

Introduction of improved equipment.
Increasingly strong alliances with "mega"-carriers.
Low service, low cost commuter operations will continue to replace short-haul scheduled service.

DRAFT

New England Transportation Initiative Airport Survey

Airport: Bangor International Airport

5. Infrastructure Investment Needs

Please list the most important programs currently ongoing or planned at your airport in the following areas:

Airport/capacity improvements

Ground access

Nav aids/airspace

Environmental protection ✓

Community relations/participation

Legislation

Financing ✓

Other

Maintenance and repair.

In which areas do you see the greatest need for future improvements at your airport?

Upgraded electronic technologies (navigation aids, tower, communications, etc.).

General operations area improvements.

Parking area improvements.

D R A F T

**New England Transportation Initiative
Airport Survey**

Airport: Bangor International Airport

6. Intermodal Transportation

Please estimate the percentage distribution of the following transportation modes used by O&D passengers at your airport:

Interstate Rail	Commuter Rail/Subway	Ship/Ferry/ Hovercraft	Bus/Van	Taxi/Limo	Automobile
			5%	25%	70%

Please indicate which of the following transportation modes you believe have potential for new or expanded services to your airport. Please check as many boxes as appropriate:

Interstate Rail	Commuter Rail/Subway	Ship/Ferry/ Hovercraft	Bus/Van	Bicycle	Pedestrian
			✓		

Please return to:

Joakim Karlsson, Hoyle, Tanner & Associates, Inc., 5 Commerce Park North, Bedford N.H. 03110

Thank you for your time and effort in filling out this survey!

DRAFT

New England Transportation Initiative Airport Survey

Airport: Burlington International Airport
Sponsor: Burlington Airport Commission

Contact: John Hamilton
Phone: 802-863-2874
Fax: 802-863-1526

1a. Historical Aviation Activity

*Please indicate the share (percentage) of enplanements at your airport which represent **connecting** passengers:*

Less than 0.1%.

*Please indicate the share (percentage) of enplanements at your airport which represent **international** passengers:*

Unknown.

DRAFT

New England Transportation Initiative Airport Survey

Airport: Burlington International Airport

1b. Historical Aviation Activity

The following tables list the historical aviation activity at your airport based on FAA statistics presented in the annual Terminal Area Forecasts and Air Traffic Activity reports. For cells indicated "missing", please provide the actual or estimated level of activity. If you collect your own aviation activity statistics and these differ significantly from the FAA values listed below, please provide us with your values. Please note that these aviation statistics are reported in Federal Fiscal Years (October 1 through September 30).

Annual Enplanements	FY 1991	FY 1992	FY 1993
Air Carrier	281,000	missing	missing
Air Taxi and Commuter	120,000	missing	missing
Total	402,000	missing	missing
		420,000	430,000

Annual Operations	FY 1991	FY 1992	FY 1993
Air Carrier	14,000	12,614	missing
			14,500
Air Taxi and Commuter	36,000	36,203	missing
			36,500
General Aviation	74,000	72,312	missing
			93,000
Total	125,000	121,129	missing
			144,000

DRAFT

New England Transportation Initiative Airport Survey

Airport: Burlington International Airport

2. Growth Trends

*For each of the listed aviation services, please check the box which most closely matches the expected trend at your airport over the next decade. Please use **N/A** to indicate services which are not applicable to your airport.*

	Growth	Stability	Decline	Unsure
Recreational/training general aviation			✓	
Business/executive general aviation		✓		
Scheduled commuter/regional service	✓			
Scheduled air carrier/national service	✓			
Scheduled international service		✓		
Connecting enplanements		✓		
Charter			✓	
Freight	✓			

Comments:

D R A F T

**New England Transportation Initiative
Airport Survey**

Airport: Burlington International Airport

3. Regional Cooperation Needs

Do you feel there is a need for the individual airports in New England to increase their level of cooperation on aviation issues? If yes, please indicate specific areas where you see the highest priority for cooperation:

Aircraft access into Logan.

Do you feel there is a need for State aviation organizations in New England to increase their level of cooperation with each other? With individual airports? If yes, please indicate specific areas where you see the highest priority for cooperation:

Can also improve coordination.

D R A F T

**New England Transportation Initiative
Airport Survey**

Airport: Burlington International Airport

4. Intra-regional Air Transportation Services

Do you feel there is a demand for increased air transportation services between your airport and city pairs within New England? Please list the cities in New England to which you believe air service could be supported (other than Boston):

No .

What trends do you expect over the next decade in the commuter airline market in New England?

Fewer large aircraft, more smaller aircraft in and around New England.

DRAFT

New England Transportation Initiative Airport Survey

Airport: Burlington International Airport

5. Infrastructure Investment Needs

Please list the most important programs currently ongoing or planned at your airport in the following areas:

Airport/capacity improvements

Larger, more suitable commuter aircraft apron.

Ground access

Improved road system and parking.

Nav aids/airspace

Instrument Landing System, Runway 33.

Environmental protection

Land acquisition program (\$2 million over next two years)

Community relations/participation

Legislation

Financing

Other

In which areas do you see the greatest need for future improvements at your airport?

Terminal access and apron aircraft parking.

D R A F T

**New England Transportation Initiative
Airport Survey**

Airport: Burlington International Airport

6. Intermodal Transportation

Please estimate the percentage distribution of the following transportation modes used by O&D passengers at your airport:

Interstate Rail	Commuter Rail/Subway	Ship/Ferry/ Hovercraft	Bus/Van	Taxi/Limo	Automobile
			1%	9%	90%

Please indicate which of the following transportation modes you believe have potential for new or expanded services to your airport. Please check as many boxes as appropriate:

None .

Interstate Rail	Commuter Rail/Subway	Ship/Ferry/ Hovercraft	Bus/Van	Bicycle	Pedestrian

Please return to:

Joakim Karlsson, Hoyle, Tanner & Associates, Inc., 5 Commerce Park North, Bedford N.H. 03110

Thank you for your time and effort in filling out this survey!

DRAFT

New England Transportation Initiative Airport Survey

Airport: Logan International Airport
Sponsor: Massachusetts Port Authority

Contact: Norm Faramelli
Phone: 617-973-5390
Fax:

1a. Historical Aviation Activity

*Please indicate the share (percentage) of enplanements at your airport which represent **connecting** passengers:*

11.5%

*Please indicate the share (percentage) of enplanements at your airport which represent **international** passengers:*

Calendar Year 1992: 15.5%
Calendar Year 1991: 14.4%

DRAFT

New England Transportation Initiative Airport Survey

Airport: Logan International Airport

1b. Historical Aviation Activity

The following tables list the historical aviation activity at your airport based on FAA statistics presented in the annual Terminal Area Forecasts and Air Traffic Activity reports. For cells indicated "missing", please provide the actual or estimated level of activity. If you collect your own aviation activity statistics and these differ significantly from the FAA values listed below, please provide us with your values. Please note that these aviation statistics are reported in Federal Fiscal Years (October 1 through September 30).

Annual Enplanements	FY 1991	FY 1992	FY 1993
Air Carrier	9,483,000	missing	missing
	9,827,482	10,232,721	10,547,757
Air Taxi and Commuter	856,000	missing	missing
	904,480	1,096,870	1,215,052
Total	10,339,000	missing	missing
	10,757,987	11,370,911	11,803,153

Annual Operations	FY 1991	FY 1992	FY 1993
Air Carrier	233,947	242,253	missing
	236,829	246,018	252,331
Air Taxi and Commuter	175,199	207,689	missing
	168,135	198,244	217,756
General Aviation & Military	31,569	32,640	missing
	22,542	25,885	23,588
Total	440,715	482,582	missing
	427,506	470,147	493,675

DRAFT

New England Transportation Initiative Airport Survey

Airport: Logan International Airport

2. Growth Trends

*For each of the listed aviation services, please check the box which most closely matches the expected trend at your airport over the next decade. Please use **N/A** to indicate services which are not applicable to your airport.*

	Growth	Stability	Decline	Unsure
Recreational/training general aviation			✓	
Business/executive general aviation			✓	
Scheduled commuter/regional service		✓		
Scheduled air carrier/national service	✓			
Scheduled international service	✓			
Connecting enplanements		✓		
Charter	✓			
Freight	✓			

Comments:

D R A F T

**New England Transportation Initiative
Airport Survey**

Airport: Logan International Airport

3. Regional Cooperation Needs

Do you feel there is a need for the individual airports in New England to increase their level of cooperation on aviation issues? If yes, please indicate specific areas where you see the highest priority for cooperation:

Yes, particularly with regard to: (1) the handling of general aviation, and (2) the development of a regional airport system, where passenger service could be provided in multiple locations (such as Worcester).

Do you feel there is a need for State aviation organizations in New England to increase their level of cooperation with each other? With individual airports? If yes, please indicate specific areas where you see the highest priority for cooperation:

Yes, specifically with regard to the development of a regional airport system with multiple airports serving the sub-regions.

D R A F T

**New England Transportation Initiative
Airport Survey**

Airport: Logan International Airport

4. Intra-regional Air Transportation Services

Do you feel there is a demand for increased air transportation services between your airport and city pairs within New England? Please list the cities in New England to which you believe air service could be supported (other than Boston):

No, service seems adequate.

What trends do you expect over the next decade in the commuter airline market in New England?

Uncertain.

DRAFT

New England Transportation Initiative Airport Survey

Airport: Logan International Airport

5. Infrastructure Investment Needs

Please list the most important programs currently ongoing or planned at your airport in the following areas:

Airport/capacity improvements

Logan Airport Modernization Program, Federal Inspection Services, Terminal E, West Parking garage and study of airside improvements

Ground access

Remote parking with express bus service (three locations), encouragement of High Occupancy Vehicles and public transportation

Nav aids/airspace

Improve Air Traffic Control (including Instrument Landing System capability)

Environmental protection

Pollution prevention, environmental auditing of tenants, water pollution control, reduction of air pollution emissions

Community relations/participation

Issues are shared with community on a regular basis

Legislation

Financing

Other

In which areas do you see the greatest need for future improvements at your airport?

Improved terminal facilities.
Improved airside improvement to reduce delay.
Improved ground access - i.e., reducing the reliance upon the private automobile with more reliance on public transportation

DRAFT

**New England Transportation Initiative
Airport Survey**

Airport: Logan International Airport

6. Intermodal Transportation

Please estimate the percentage distribution of the following transportation modes used by O&D passengers at your airport:

Interstate Rail	Commuter Rail/Subway	Ship/Ferry/ Hovercraft	Bus/Van	Taxi/Limo	Automobile
	10.0%	0.5%	9.0%	26.5% ¹	54.0% ²

¹ 19.5% taxi, 7.0% limo

² 15% car rental, 21% drop-off/pick-up, 18% parking

Please indicate which of the following transportation modes you believe have potential for new or expanded services to your airport. Please check as many boxes as appropriate:

Interstate Rail	Commuter Rail/Subway	Ship/Ferry/ Hovercraft	Bus/Van	Bicycle	Pedestrian
	✓	✓	✓		

Please return to:

Joakim Karlsson, Hoyle, Tanner & Associates, Inc., 5 Commerce Park North, Bedford N.H. 03110

Thank you for your time and effort in filling out this survey!

D R A F T

New England Transportation Initiative Airport Survey

Airport: Pease International Tradeport
Sponsor: Pease Development Authority

Contact: Eugene Schneider
Phone: 603-433-6088
Fax: 603-427-0433

1a. Historical Aviation Activity

*Please indicate the share (percentage) of enplanements at your airport which represent **connecting** passengers:*

0%

*Please indicate the share (percentage) of enplanements at your airport which represent **international** passengers:*

0%

DRAFT

New England Transportation Initiative Airport Survey

Airport: Pease International Tradeport

1b. Historical Aviation Activity

The following tables list the historical aviation activity at your airport based on FAA statistics presented in the annual Terminal Area Forecasts and Air Traffic Activity reports. For cells indicated "missing", please provide the actual or estimated level of activity. If you collect your own aviation activity statistics and these differ significantly from the FAA values listed below, please provide us with your values. Please note that these aviation statistics are reported in Federal Fiscal Years (October 1 through September 30).

Annual Enplanements	FY 1991	FY 1992	FY 1993
Air Carrier	missing	missing	0
	0	0	0
Air Taxi and Commuter	missing	missing	missing
	0	0	24,821
Total	missing	missing	missing
	0	0	24,831

Annual Operations	FY 1991	FY 1992	FY 1993
Air Carrier	missing	missing	396
Air Taxi and Commuter	missing	429	10,341
General Aviation & Military	missing	22,309	31,683
	21,781		
Total	missing	22,738	42,420
	21,781		

DRAFT

New England Transportation Initiative Airport Survey

Airport: Pease International Tradeport

2. Growth Trends

*For each of the listed aviation services, please check the box which most closely matches the expected trend at your airport over the next decade. Please use **N/A** to indicate services which are not applicable to your airport.*

	Growth	Stability	Decline	Unsure
Recreational/training general aviation	✓			
Business/executive general aviation	✓			
Scheduled commuter/regional service	✓			
Scheduled air carrier/national service	✓			
Scheduled international service	✓			
Connecting enplanements	✓			
Charter	✓			
Freight	✓			

Comments:

DRAFT

New England Transportation Initiative Airport Survey

Airport: Pease International Tradeport

3. Regional Cooperation Needs

Do you feel there is a need for the individual airports in New England to increase their level of cooperation on aviation issues? If yes, please indicate specific areas where you see the highest priority for cooperation:

It has been our experience that individual New England airports have been very cooperative and that no improvements seem necessary at this time.

Do you feel there is a need for State aviation organizations in New England to increase their level of cooperation with each other? With individual airports? If yes, please indicate specific areas where you see the highest priority for cooperation:

We have been very well supported by the New Hampshire Department of Transportation Division of Aeronautics and see no need for an increased level of cooperation

D R A F T

**New England Transportation Initiative
Airport Survey**

Airport: Pease International Tradeport

4. Intra-regional Air Transportation Services

Do you feel there is a demand for increased air transportation services between your airport and city pairs within New England? Please list the cities in New England to which you believe air service could be supported (other than Boston):

Bradley International Airport, Hartford, CT
Barnstable Airport, Hyannis, MA (summer only)

What trends do you expect over the next decade in the commuter airline market in New England?

Increased demand.

DRAFT

New England Transportation Initiative Airport Survey

Airport: Pease International Tradeport

5. Infrastructure Investment Needs

Please list the most important programs currently ongoing or planned at your airport in the following areas:

Airport/capacity improvements

Airline terminal.

Ground access

Economic Development Agency (EDA) infrastructure improvements.

Nav aids/airspace

Instrument Landing System (Runway 16), new approach lights, Category II Instrument Landing System.

Environmental protection

Best management practices (stormwater), deicing improvements (runway and aircraft), underground storage tank removal.

Community relations/participation

Part 150 study, Airport Master Plan study.

Legislation

Pease Development Authority-New Hampshire Port Authority merger.

Financing

Military Airport Program
Airport Improvement Program
EDA Grant Program

Other

Pavement rehabilitation.

In which areas do you see the greatest need for future improvements at your airport?

Airline terminal, customs facility, pavements, navigation aids.

D R A F T

**New England Transportation Initiative
Airport Survey**

Airport: Pease International Tradeport

6. Intermodal Transportation

Please estimate the percentage distribution of the following transportation modes used by O&D passengers at your airport:

Interstate Rail	Commuter Rail/Subway	Ship/Ferry/ Hovercraft	Bus/Van	Taxi/Limo	Automobile
			2%	3%	95%

Please indicate which of the following transportation modes you believe have potential for new or expanded services to your airport. Please check as many boxes as appropriate:

Interstate Rail	Commuter Rail/Subway	Ship/Ferry/ Hovercraft	Bus/Van	Bicycle	Pedestrian
			✓	✓	

Please return to:

Joakim Karlsson, Hoyle, Tanner & Associates, Inc., 5 Commerce Park North, Bedford N.H. 03110

Thank you for your time and effort in filling out this survey!

DRAFT

New England Transportation Initiative Airport Survey

Airport: Portland International Jetport

Sponsor: City of Portland

Contact: Jeff Schultes

Phone: 207-772-0690

Fax: 207-774-7740

1a. Historical Aviation Activity

*Please indicate the share (percentage) of enplanements at your airport which represent **connecting** passengers:*

None

*Please indicate the share (percentage) of enplanements at your airport which represent **international** passengers:*

None

DRAFT

New England Transportation Initiative Airport Survey

Airport: Portland International Jetport

1b. Historical Aviation Activity

The following tables list the historical aviation activity at your airport based on FAA statistics presented in the annual Terminal Area Forecasts and Air Traffic Activity reports. For cells indicated "missing", please provide the actual or estimated level of activity. If you collect your own aviation activity statistics and these differ significantly from the FAA values listed below, please provide us with your values. Please note that these aviation statistics are reported in Federal Fiscal Years (October 1 through September 30).

Annual Enplanements	FY 1991	FY 1992	FY 1993
Air Carrier	453,000	missing	missing
	451,541	447,808	400,689
Air Taxi and Commuter	98,000	missing	missing
	103,947	159,349	194,959
Total	551,000	missing	missing
	555,488	607,157	595,648

Annual Operations	FY 1991	FY 1992	FY 1993
Air Carrier	18,215	17,130	missing
	18,195	17,094	14,228
Air Taxi and Commuter	27,042	30,442	missing
	25,603	32,543	36,876
General Aviation & Military	66,557	69,549	missing
	67,141	72,387	74,259
Total	111,834	117,121	missing
	110,939	122,024	125,363

DRAFT

New England Transportation Initiative Airport Survey

Airport: Portland International Jetport

2. Growth Trends

*For each of the listed aviation services, please check the box which most closely matches the expected trend at your airport over the next decade. Please use **N/A** to indicate services which are not applicable to your airport.*

	Growth	Stability	Decline	Unsure
Recreational/training general aviation			✓	
Business/executive general aviation		✓		
Scheduled commuter/regional service	✓			
Scheduled air carrier/national service	✓			
Scheduled international service				N/A
Connecting enplanements				N/A
Charter		✓		
Freight	✓			

Comments:

D R A F T

**New England Transportation Initiative
Airport Survey**

Airport: Portland International Jetport

3. Regional Cooperation Needs

Do you feel there is a need for the individual airports in New England to increase their level of cooperation on aviation issues? If yes, please indicate specific areas where you see the highest priority for cooperation:

I feel that at present there is a good networking with airports, which primarily come through active involvement with the American Association of Airport Executives national organization and its New England Chapter.

Do you feel there is a need for State aviation organizations in New England to increase their level of cooperation with each other? With individual airports? If yes, please indicate specific areas where you see the highest priority for cooperation:

DRAFT

New England Transportation Initiative Airport Survey

Airport: Portland International Jetport

4. Intra-regional Air Transportation Services

Do you feel there is a demand for increased air transportation services between your airport and city pairs within New England? Please list the cities in New England to which you believe air service could be supported (other than Boston):

Portland has extremely good service throughout New England. I have listed below our destination cities in the Northeast along with the number of daily departures:

Jet Carrier

Albany (2)
Boston (3)
Newark (4)
Philadelphia (4)
Pittsburgh (1)

Commuter

Bangor (1)
Boston (30)
Manchester (2)
La Guardia (11)
Newark (2)
Portsmouth (2)
Presque Isle (2)
Dulles (3)

The only service that Portland needs is jet service to Baltimore or Washington National. We feel that this service will be initiated as soon as the terminal building is expanded.

What trends do you expect over the next decade in the commuter airline market in New England?

DRAFT

New England Transportation Initiative Airport Survey

Airport: Portland International Jetport

5. Infrastructure Investment Needs

Please list the most important programs currently ongoing or planned at your airport in the following areas:

Airport/capacity improvements

Ground access

Ongoing Airport Master Plan Update will address this area.

Nav aids/airspace

Environmental protection

Ongoing Airport Master Plan Update will address this area.

Community relations/participation

Legislation

Financing

Portland has received Passenger Facility Charge (PFC) funding to expand its terminal building.

Other

Other areas of concern are with legislation concerning Airport Improvement Program and financing because we anticipate requiring substantial funds.

In which areas do you see the greatest need for future improvements at your airport?

DRAFT

**New England Transportation Initiative
Airport Survey**

Airport: Portland International Jetport

6. Intermodal Transportation

Please estimate the percentage distribution of the following transportation modes used by O&D passengers at your airport:

Interstate Rail	Commuter Rail/Subway	Ship/Ferry/ Hovercraft	Bus/Van	Taxi/Limo	Automobile

Please indicate which of the following transportation modes you believe have potential for new or expanded services to your airport. Please check as many boxes as appropriate:

Interstate Rail	Commuter Rail/Subway	Ship/Ferry/ Hovercraft	Bus/Van	Bicycle	Pedestrian

At this time the Airport has no information on the distribution of arriving passengers by the various modes of transportation. In order to provide travelers with options, the Airport has recently opened a Ground Transportation Center to aid passengers in making alternative choices.

Please return to:

Joakim Karlsson, Hoyle, Tanner & Associates, Inc., 5 Commerce Park North, Bedford N.H. 03110

Thank you for your time and effort in filling out this survey!

